

DIVING SAFETY MANUAL



**STATE OF CALIFORNIA
RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME**

TABLE OF CONTENTS

SECTION 1.00

GENERAL POLICY

1.10 THE SCIENTIFIC DIVING STANDARDS	1
1.11 PURPOSE.....	1
1.12 SCIENTIFIC DIVING DEFINITION	2
1.13 SCIENTIFIC DIVING EXEMPTION	2
1.20 OPERATIONAL CONTROL.....	3
1.21 DIVING SAFETY MANAGER	3
1.22 DIVING SAFETY OFFICER.....	3
1.23 DIVING SAFETY BOARD	3
<i>1.23.1 Duties of the Diving Safety Board</i>	<i>4</i>
1.24 INSTRUCTIONAL PERSONNEL.....	4
1.25 RECIPROCITY AND VISITING SCIENTIFIC DIVER	4
1.26 WAIVER OF REQUIREMENTS.....	5
1.27 CONSEQUENCE OF VIOLATION OF REGULATIONS BY SCIENTIFIC DIVERS.....	5
1.28 INDIVIDUAL DIVER RESPONSIBILITY.....	5
1.30 GENERAL DEFINITIONS	5
1.40 RECORD MAINTENANCE.....	6

SECTION 2.00

PROCEDURES

2.10 INTRODUCTION	7
2.20 PRE-DIVE PROCEDURES	7
2.21 DIVE PLANS	7
2.22 PRE-DIVE SAFETY CHECKS.....	8
2.30GENERAL PROCEDURES	8
2.31 SOLO DIVING PROHIBITION.....	8
2.32 REFUSAL TO DIVE	8
2.33 TERMINATION OF THE DIVE	9
2.34 EMERGENCIES AND DEVIATIONS FROM REGULATIONS.....	9
2.35 CONTAMINATED ENVIRONMENTS.....	9
2.36 DIVING UNDER THE INFLUENCE OF DRUGS OR INTOXICANTS	9
2.40 DIVING PROCEDURES	9
2.41 DIVE TEAM LEADER	9

2.42	DUTIES OF THE DIVE TEAM LEADER INCLUDE:	10
2.43	DIVE TEAMS	10
2.44	INCIDENT COMMAND SYSTEM (ICS).....	11
2.50	POST-DIVE PROCEDURES	11
2.51	POST-DIVE SAFETY CHECKS	11
2.60	EMERGENCY PROCEDURES	11
2.70	TRAVELING AFTER DIVING.....	11
2.80	BLOOD DONATION.....	11
2.90	RECORD KEEPING AND REQUIREMENTS.....	12
2.91	PERSONAL DIVING LOG.....	12
2.92	MONTHLY DIVE LOG.....	12
2.93	DIVE PAY	12
2.94	REQUIRED INCIDENT REPORTING.....	13

SECTION 3.00

DIVING EQUIPMENT

3.10	GENERAL POLICY.....	15
3.20	REQUIRED PERSONAL EQUIPMENT.....	15
3.21	REGULATOR	15
3.22	BREATHING MASKS AND HELMETS.....	15
3.23	SCUBA CYLINDERS	16
3.24	BACKPACK, WEIGHTING SYSTEM, AND FLOTATION DEVICE	16
3.25	SOUND MAKING DEVICE.....	16
3.26	FACEMASK	16
3.27	TIMING DEVICE, DEPTH AND PRESSURE GAUGES.....	16
3.28	FINS.....	17
3.29	CUTTING TOOL.....	17
3.30	SNORKEL.....	17
3.31	COMPASS.....	17
3.32	DIVE LIGHT.....	17
3.33	THERMAL PROTECTIVE SUIT	17
3.34	METHOD OF DETERMINATION OF DECOMPRESSION STATUS: DIVE TABLES, DIVE COMPUTERS.....	17
3.40	REQUIRED DIVE TEAM EQUIPMENT	17
3.41	DIVING FLAG.....	17
3.42	EMERGENCY OXYGEN DELIVERY SYSTEM.....	18
3.43	FIRST AID SUPPLIES.....	18
3.50	AUXILIARY EQUIPMENT.....	18
3.51	HANDHELD UNDERWATER POWER TOOLS	18
3.52	COMPRESSOR SYSTEMS	18

3.53	OXYGEN SYSTEMS.....	18
3.60	EQUIPMENT MAINTENANCE.....	19
3.61	RECORD KEEPING.....	19
3.62	COMPRESSOR OPERATION AND AIR TEST RECORDS.....	20
3.70	SCHEDULES OF MAINTENANCE.....	20
3.71	REGULATORS.....	20
3.72	SCUBA CYLINDERS	20
3.73	SUBMERSIBLE (TANK) PRESSURE GAUGE	20
3.74	BUOYANCY COMPENSATORS	20
3.75	DEPTH GAUGES.....	20
3.76	DIVE COMPUTERS	20
3.77	EMERGENCY OXYGEN DELIVERY SYSTEMS.....	21
3.80	AIR QUALITY STANDARDS	21
DIVER CERTIFICATION FLOW-CHART.....		22

SECTION 4.00

DIVER CERTIFICATION

4.10	CERTIFICATION	23
4.20	CERTIFICATION TYPES	23
4.21	DEPARTMENT SCIENTIFIC DIVER CERTIFICATION.....	23
4.22	RESTRICTED CERTIFICATION (DIVER IN TRAINING).....	23
4.30	REQUIREMENTS FOR DEPARTMENT DIVER CERTIFICATION	24
4.31	DOCUMENTS.....	24
4.32	EVALUATION.....	25
4.32.1	<i>Training</i>	25
4.32.2	<i>Written Examination</i>	26
4.32.3	<i>Swimming Evaluation (Pool or Similar Conditions)</i>	26
4.32.4	<i>Open Water Evaluation</i>	27
4.32.5	<i>Dive Requirements</i>	29
4.40	DEPTH CERTIFICATIONS	29
4.41	DEPTH CERTIFICATION LEVELS.....	29
4.50	ANNUAL DIVER RECERTIFICATION:.....	30
4.60	MAINTENANCE OF CERTIFICATION	31
4.61	MINIMUM ACTIVITY TO MAINTAIN CERTIFICATION	31
4.62	MEDICAL EXAMINATION	31
4.70	REVOCATION OF CERTIFICATION.....	31

4.80 RECERTIFICATION AFTER LAPSE OR REVOCATION.....	31
--	-----------

SECTION 5.00

MEDICAL STANDARDS

5.10 MEDICAL REQUIREMENTS	33
--	-----------

5.11	GENERAL.....	33
5.12	CONTENT OF MEDICAL EVALUATIONS	33
5.13	INFORMATION PROVIDED TO THE EXAMINING PHYSICIAN.....	33
5.14	CONDITIONS WHICH MAY DISQUALIFY CANDIDATES FROM DIVING.....	34
5.15	LABORATORY REQUIREMENTS FOR DIVING MEDICAL EXAMINATION:.....	34
5.16	PHYSICIAN'S WRITTEN REPORT	34

SECTION 6.00

SPECIALIZED DIVING MODES

6.10 GENERAL	35
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6.11	SPECIALIZED DIVING MODES DEFINED	35
6.12	PRIOR APPROVAL REQUIRED.....	35

6.20 NITROX DIVING.....	36
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6.21	PREREQUISITES.....	36
6.21.1	Eligibility	36
6.21.2	Requirements for Authorization to Use Nitrox.....	36
6.21.3	Training.....	36
6.21.4	Examinations.....	36
6.21.5	Minimum Activity to Maintain Authorization.....	37
6.22	NITROX TRAINING GUIDELINES	37
6.22.1	Classroom Instruction.....	37
6.22.2	Practical Training.....	37
6.22.3	Written Examination (based on classroom instruction and practical training).....	38
6.22.4	Openwater Dives.....	38
6.22.5	Surface-Supplied Training.....	38
6.23	NITROX DIVING PERSONNEL REQUIREMENTS.....	39
6.23.1	Nitrox Diver in Training.....	39
6.23.2	Scientific Diver.....	39
6.23.3	Lead Diver.....	39
6.24	NITROX DIVE PARAMETERS.....	39
6.24.1	Oxygen Exposure Limits	39
6.24.2	Bottom Time Limits	40
6.24.3	Decompression Tables and Gases.....	40
6.24.4	Nitrox Dive Computers	40
6.24.5	Repetitive Diving	41
6.24.6	Oxygen Parameters.....	41
6.25	GAS MIXING AND ANALYSIS	42
6.25.1	Personnel Requirements.....	42

6.25.2	<i>Production Methods</i>	42
6.25.3	<i>Analysis Verification by User</i>	42
6.26	NITROX DIVING EQUIPMENT	42
6.26.1	<i>Oxygen Cleaning and Maintenance Requirements</i>	42
6.26.2	<i>Equipment Requirements</i>	42
6.27	TRAINING REQUIREMENTS.....	44
6.28	OPERATIONAL REQUIREMENTS.....	44
6.30	STAGED DECOMPRESSION DIVING	44
6.31	DIVES SHALLOWER THAN 130 FEET	44
6.32	DIVES DEEPER THAN 130 FEET	45
6.33	TRAINING REQUIREMENTS.....	45
6.34	EQUIPMENT REQUIREMENTS.....	45
6.35	OPERATIONAL REQUIREMENTS.....	46
6.40	RESTRICTED OVERHEAD ENVIRONMENTS	47
6.41	TRAINING REQUIREMENTS.....	47
6.42	EQUIPMENT REQUIREMENTS.....	47
6.43	OPERATIONAL REQUIREMENTS.....	48
6.50	BLUEWATER DIVING	48
6.51	TRAINING REQUIREMENTS.....	48
6.52	EQUIPMENT REQUIREMENTS.....	49
6.53	OPERATIONAL REQUIREMENTS.....	49
6.60	SURFACE-SUPPLIED DIVING	49
6.61	TRAINING REQUIREMENTS.....	50
6.62	EQUIPMENT REQUIREMENTS.....	50
6.63	OPERATIONAL REQUIREMENTS.....	50
6.70	LIGHT MAINTENANCE DIVING	50
6.71	OPERATIONAL REQUIREMENTS.....	50
6.80	PETROLEUM CONTAMINATED WATER DIVES	52
6.81	OPERATIONAL REQUIREMENTS.....	52
6.90	CLOSED CIRCUIT REBREATHERS	53
6.91	TRAINING REQUIREMENTS.....	53
6.92	OPERATIONAL REQUIREMENTS.....	54
6.93	GENERAL OPERATIONAL REQUIREMENTS.....	54
APPENDIX 1		
DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN		56
APPENDIX 2		
MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT		58
APPENDIX 3		
DIVING MEDICAL HISTORY FORM.....		60

APPENDIX 4	
AAUS CHECKOUT DIVE AND TRAINING EVALUATION	62
APPENDIX 5	
GUIDELINES FOR DIVE COMPUTER USE.....	63
APPENDIX 6	
REQUEST FOR DIVING RECIPROCITY FORM VERIFICATION OF DIVER TRAINING AND EXPERIENCE.....	64
APPENDIX 7	
DIVING INJURY/INCIDENT REPORT FORM.....	65
APPENDIX 8	
DEPARTMENT REPORT OF MINOR INJURY.....	66
APPENDIX 9	
DIVING EMERGENCY MANAGEMENT PROCEDURES FORM.....	67
APPENDIX 10	
DIVING WITH NITROX FORM	68
APPENDIX 11	
CALIFORNIA DEPARTMENT OF FISH & GAME MONTHLY DIVING LOG.....	69
APPENDIX 12	
INFORMATION FOR SCUBA DIVER APPLICANTS.....	70
APPENDIX 13	
SCUBA EXAM (JUNE 1999 EDITION).....	74
APPENDIX 14	
APPLICATION FOR SCUBA DIVER CERTIFICATION	88
APPENDIX 15	
DEFINITION OF TERMS.....	90

SECTION 1.00**GENERAL POLICY****1.10 THE SCIENTIFIC DIVING STANDARDS**

As stewards of California's diverse natural resources, the Department of Fish and Game has a responsibility to protect and conserve the State's environments and wildlife. To help fulfill this responsibility in marine and aquatic habitats, the Department has established the Diving Safety Program.

The Department of Fish and Game (Department) will administer its Diving Safety Program in a safe, efficient manner to attain its objectives. The Diving Safety Program will also maintain adequate protection for its employees, property, and those for whom the Department has a responsibility.

In 1982, OSHA exempted scientific diving from commercial diving regulations (29 CFR Part 1910, Subpart T) under certain conditions that are outlined below. The final guidelines for the exemption became effective in 1985 (Federal Register, Vol. 50, No.6, p.1046). This manual prescribes the necessary conditions to meet the scientific diving exemption. It also conforms to the requirements of the American Academy of Underwater Sciences (AAUS).

This manual prescribes the administration of and safety rules for the Department's Diving Safety Program and the policy for implementing the requirements of Title 8, Article 152, *California Administrative Code* (Title 8). The relationship between the Diving Safety Program, use of Department divers, and the Incident Command System (ICS) is also established.

Department projects and programs require diving operations to accomplish their goals and responsibilities. The use of employees as divers is essential to the efficient accomplishment of departmental operations.

1.11 Purpose

The purpose of the Diving Safety Program includes:

Safety: to insure that all diving performed by Department employees is conducted in a safe and healthful manner.

Operational Standards: to set forth rules, regulations, and standards for certification, periodic recertification, supervision, procedures, review of records, and equipping of divers.

Reciprocity: to establish a safe working relationship between Department divers and divers of other governmental, scientific, educational, and private diving programs.

Goals: to implement Department goals and responsibilities including research, management, law enforcement, training, and operational objectives.

1.12 Scientific Diving Definition

Scientific diving is defined (29 CFR 1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

These regulations shall apply to all Department employees, and those persons authorized to dive with employees under the auspices of this diving program.

The diver's supervisor shall authorize the necessary time to maintain certification and will budget the monies for diving pay, equipment, travel, and medical examination.

1.13 Scientific Diving Exemption

OSHA has granted an exemption for scientific diving from commercial diving regulations under the following guidelines (29 CFR Part 1910, Appendix B to Subpart T):

The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operation.

The purpose of a project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.

The tasks of a scientific diver are those of an observer and data gatherer. Construction and troubleshooting tasks traditionally associated with commercial diving are not included within scientific diving.

Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and therefore, are scientists or scientists-in-training.

In addition, the scientific diving program shall contain at least the following elements:

Diving Safety Manual which includes at a minimum: Procedures covering all diving operations specific to the program; including procedures for emergency care, recompression and evacuation; and the criteria for diver training and certification.

Diving Control (Safety) Board, with the majority of its members being active scientific divers, which shall at a minimum have the authority to: approve and monitor diving projects, review and revise

the diving safety manual, assure compliance with the manual, certify the depths to which a diver has been trained, take disciplinary action for unsafe practices, and assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for scuba diving.

1.20 OPERATIONAL CONTROL

1.21 Diving Safety Manager

Overall administration of the Department's diving activities shall be the responsibility of the Diving Safety Manager (DSM), appointed by the Director of the Department of Fish and Game. The DSM will appoint a Diving Safety Board that assists and advises the Diving Safety Officer.

1.22 Diving Safety Officer

The Diving Safety Officer (DSO) shall act as supervisor of the day to day operations of the Diving Safety Program. In this capacity, the DSO shall have full authority to take any action permitted or required of the DSM by this manual. The DSO shall ensure that all correspondence, diving files, and records are maintained; and will ensure that any required administrative duties are performed. The DSO shall act as a training coordinator for Department diving programs.

The DSO shall be a trained SCUBA diver and certified diving instructor, and shall have at least two years of experience in a Scientific (Research) or Public Safety diving program which meets the standards of Title 8. The DSO shall be a member as defined by the AAUS.

1.23 Diving Safety Board

The Diving Safety Board (DSB) shall consist of the DSO and at least four employees who are trained and active SCUBA divers, certified to a depth of at least 100 feet, and have a minimum of one year's regular diving experience with the Department. To comply with the membership requirements of the AAUS, a majority of the DSB must be active Scientific (Research) divers. At least one member shall be a Conservation Education and Enforcement Branch officer. The DSM may appoint other members to the DSB, so long as the majority is active scientific divers.

The DSB's primary responsibility is to insure a safe and efficient diving operation. The members shall serve as the Department's technical experts and shall assist the DSO in conducting the dive training and safety programs.

One member shall be designated as Chairperson by the DSB members to serve a 2-year term. The DSB must meet at least four times a year; meetings by teleconference may be used to meet this requirement.

New DSB members shall become certified at least to the level of assistant instructor. The cost of this certification will be a Department responsibility.

1.23.1 Duties of the Diving Safety Board

Reviewing of applications for certification.

Administering and overseeing certification, examinations, and other courses.

Conducting annual recertification of Department certified divers. The DSB may delegate various recertification responsibilities to other Department certified divers.

Investigating diving accidents, incidents, and injuries and submitting written reports to the DSM, including recommendations for avoiding similar events.

Revoking diver certification for cause. Such action requires the concurrence of two DSB members and the approval of the DSM.

Reviewing Department diving operations.

Establishing an approved list of non-Department divers with whom Department divers may dive on work assignments.

Reviewing the use of Department divers in ICS responses, and ensuring that Department divers have received appropriate training for the tasks for which they are deployed.

Addressing any other diving related activities that arise.

1.24 Instructional Personnel

Qualifications:

All personnel involved in diving instruction under Department auspices shall be qualified for the type of instruction being given.

Selection:

Instructional personnel will be selected by the responsible administrative officer, or his/her designee, who will solicit the advice of the DSB in conducting preliminary screening of applicants for instructional positions.

1.25 Reciprocity And Visiting Scientific Diver

When divers from another AAUS Organizational Member engage jointly in diving activities, or engage jointly in the use of diving resources, Either the Department's or the other AAUS Member's

Diving Safety Board shall be designated to govern the joint dive project.

A scientific diver from another AAUS Organizational Member shall apply for permission to dive under Department auspices by submitting a document, containing all the information described in Appendix 6 (letter of reciprocity), signed by the Diving Safety Officer or Chairperson of their Diving Control (Safety) Board.

A visiting scientific diver may be asked to demonstrate his/her knowledge and skills for the planned diving. An example of items to be demonstrated is presented in Appendix 4 (checkout dive).

If the Department denies a visiting scientific diver permission to dive, the Diving Safety Board shall notify the visiting scientific diver and Diving Control Board with an explanation of all reasons for the denial.

1.26 Waiver of Requirements

The Diving Safety Board may grant a waiver for specific requirements of training, examinations, depth certification, and minimum activity to maintain certification.

1.27 Consequence of Violation of Regulations by Scientific Divers

Failure to comply with the regulations of this diving manual may be cause for the revocation or restriction of the diver's scientific diving certificate by action of the Diving Safety Board.

1.28 Individual Diver Responsibility

Divers are **RESPONSIBLE FOR THEIR OWN BEHAVIOR AND SAFETY**. It is each diver's responsibility and privilege to refuse to dive if, in the diver's judgment, conditions are unsafe or unfavorable, or if diving would violate the dictates of training, these regulations, or other applicable regulations.

1.30 GENERAL DEFINITIONS

The following definitions apply to the types of diving covered in this manual. For specific definitions of terms used in the manual see Appendix 15.

Dive. For the purposes of record keeping and certification maintenance a "dive" will consist of the following: an entry; an underwater activity using compressed gas; an exit; and a minimum ten minute surface interval.

Diver. A "diver" is a SCUBA certified employee conducting a dive. A Department employee may not dive on Department time or use Department diving equipment unless certified by the DSO as a diver.

Scientific Dive. A scientific dive is a dive to collect scientific data by, or under the direction of a scientist.

Law Enforcement/Public Safety Dive. Law enforcement or public safety dives are those made in the course of enforcing regulations or laws or assisting in emergency response by, or under the direction of, a peace officer or emergency personnel. These dives are not scientific dives, and not covered by the OSHA exemption.

Light Maintenance Dive. Light Maintenance Dives are those made to perform routine or emergency maintenance on, repair, or installation of equipment to a vessel, recover or salvage items other than those used in a scientific or public safety investigation (evidence recovery), or to conduct routine monitoring activities at a hazardous material investigation that is not part of a scientific or public safety investigation. These dives have special requirements (Section 6.70). The DSO must approve dives requiring heavy equipment.

Training Dive. Training dives are those in which divers participate in order to fulfill certification or instructional requirements. Training dives conducted outside Department auspices must be approved as training by the DSO.

1.40 RECORD MAINTENANCE

The Diving Safety Officer or his/her designee shall maintain permanent records for each individual scientific diver certified. The file shall include evidence of certification level, log sheets, results of current physical examination, waiver, reports of disciplinary actions by the Diving Safety Board, and other pertinent information deemed necessary.

Availability of Records:

Medical records shall be available to the attending physician of a diver or former diver when released in writing by the diver.

Records and documents required by this standard shall be retained for the following period:

Physician's written reports of medical examinations for dive team members - 5 years.

Manual for diving safety - current document only.

Records of dive - 1 year, except 5 years where there has been an incident of pressure-related injury.

Pressure-related injury assessment - 5 years.

Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service.

SECTION 2.00

PROCEDURES

2.10 INTRODUCTION

No person shall engage in scientific diving operations under Department auspices unless he/she holds a current certification issued pursuant to the provisions of this manual.

2.20 PRE-DIVE PROCEDURES

2.21 Dive Plans

Dives should be planned around the competency of the least experienced diver. Before conducting any diving operations under the auspices of the organizational member, the diving supervisor for a proposed operation must formulate a dive plan that should include the following:

Divers' qualifications and the type of certificate or certification held by each diver.

Emergency management procedures (see Appendix 9) with the following information:

Name, telephone number, and relationship of person to be contacted for each diver in the event of an emergency.

Nearest accessible hospital and operational recompression chamber.

Available means of transport.

Approximate number of proposed dives.

Location(s) of proposed dives.

Estimated depth(s) and bottom time(s) anticipated.

Decompression status and repetitive dive plans, if required.

Proposed work, equipment, and boats to be employed.

Any hazardous conditions anticipated.

2.22 Pre-dive Safety Checks

Diver's Responsibility:

Each scientific diver shall conduct a functional check of his/her diving equipment in the presence of the diving buddy or tender.

It is the diver's responsibility and duty to refuse to dive if, in his/her judgement, conditions are unfavorable, or if he/she would be violating the precepts of his/her training, or this manual (Section 1.28).

No dive team member shall be required to be exposed to hyperbaric conditions against his/her will, except when necessary to prevent or treat a pressure-related injury.

No dive team member shall be permitted to dive for the duration of any known condition that is likely to adversely affect the safety and health of the diver or other dive members.

Equipment Evaluations:

Each diver shall insure that his/her equipment is in proper working order and that the equipment is suitable for the type of diving operation.

Each diver shall have the capability of achieving and maintaining positive buoyancy.

Site Evaluation:

The environmental conditions at the site will be evaluated.

2.30 GENERAL PROCEDURES

2.31 Solo Diving Prohibition

All diving activities shall adhere to the buddy system (Two comparably equipped divers in the water in constant communication). This buddy system is based on mutual assistance, especially in an emergency. In the case of a tethered diver with direct communication to the surface, the buddy may be a fully suited diver, prepared to assist.

2.32 Refusal to Dive

The decision to dive is that of the diver. A diver may refuse to dive, without fear of penalty, whenever the diver believes it is unsafe to make the dive (Section 1.28).

2.33 Termination of the Dive

It is the responsibility of the diver to terminate the dive, without fear of penalty, whenever it is unsafe to continue, unless it compromises the safety of another diver already in the water.

The dive shall be terminated while there is still sufficient breathing gas to permit the diver to safely reach the surface, including any required decompression time, or to safely reach an additional air source.

2.34 Emergencies and Deviations from Regulations

Any diver may deviate from the requirements of this manual to the extent necessary to prevent or minimize a situation that is likely to cause death, serious physical harm, or major environmental damage. A written report of such actions must be submitted to the Diving Safety Board explaining the circumstances and justifications.

2.35 Contaminated Environments

Any diver requested to dive in a known contaminated environment shall notify the DSO before proceeding. Dives conducted in petroleum contaminated water shall follow the procedures set forth in the Specialized Diving Modes section of this manual (Section 6.80).

In the event a diver is exposed to environmental contamination in the course of a normal working dive, the diver shall immediately notify the DSO or DSB and consult a physician.

2.36 Diving under the influence of drugs or intoxicants

Alcoholic beverages will not be consumed eight hours before any dive.

Divers will not use drugs while diving without the specific consent of a physician.

2.40 DIVING PROCEDURES

2.41 Dive Team Leader

An appropriately qualified diver will be designated by the dive team as the team leader for each dive or series of dives. The team leader is responsible for the diving operation. Level of experience and training in dealing with the task at hand shall supersede rank/classification in selecting a dive team leader.

2.42 Duties of the dive team leader include:

Coordinating diving activity with other known activities in the vicinity, which are likely to interfere with diving operations.

Determining that dive team members are aware of: dive objectives, unusual hazards or environmental conditions likely to affect safety, modifications to diving or emergency procedures necessitated by the specific diving operation, and the operational and emergency assets available.

Ensuring timely reporting of any physical problems or adverse physiological effects as a result of diving, including symptoms of pressure related injuries and their resolution.

Ensuring safety and emergency equipment is in working order and at the dive site.

Suspending diving operations if in his/her opinion conditions are not safe.

Determining that the team members have conducted a functional check of individual diving equipment and that the team member's current state of fitness is adequate before diving activities begin.

Inquiring into the fitness of the dive team members upon completion of a day's diving.

Planning the diving operation to include the safety and health aspects of: diving mode; surface and underwater conditions and hazards (including boat propellers); breathing gas supply, thermal protection, diving equipment, and dive team assignments; residual inert gas status of team members, decompression schedules, altitude corrections, emergency procedures, and any other incidental requirements specified in the dive plan.

2.43 Dive Teams

Close continuous contact must be maintained during each dive. Upon loss of contact, divers should check the surrounding area to re-establish contact. If contact is not made in a reasonable period, the divers shall surface and establish contact. The dive will be terminated when any team member runs low on breathing gas or approaches any other safe diving limitation.

Each buddy team will have an abstract of an emergency evacuation and emergency medical plan and diving tables appropriate to the dive mode available for immediate reference before and after each dive.

2.44 Incident Command System (ICS)

The Department has selected the ICS for managing all responses, including multi-agency and multi-jurisdictional emergencies. Department employees shall use the ICS when responding to pollution, wildfire, public safety, or other incidents.

The diving program shall participate in the ICS as the Dive Operations Branch of the Operations Section. Either the DSO, a member of the DSB, or a dive team leader having training or experience in dealing with the technical factors specific to the incident shall serve as the Branch Director, and shall report to the Operations Section Chief. The Dive Operations Branch Director shall be delegated full authority over the deployment of Department divers. Nothing herein shall override the "Individual Responsibility" (Section 1.28).

2.50 POST-DIVE PROCEDURES

2.51 Post-Dive Safety Checks

After the completion of a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions.

Divers should remain awake for at least one hour after diving, and in the company of a dive team member who is prepared to assist the diver if necessary.

2.60 EMERGENCY PROCEDURES

Each diving project, supervisor, or lead diver will develop emergency procedures appropriate to their activities. It is essential that emergency procedures be pre-planned and understood by all divers and surface support personnel to insure that appropriate medical treatment is initiated as soon as possible. Procedures include extrication, treatment, evacuation, and Emergency Medical Services (EMS) response based on local resources. To facilitate these components, divers should use the Diving Emergency Management Procedures Form (Appendix 9).

2.70 TRAVELING AFTER DIVING

Divers should have a minimum surface interval of 24 hours before ascending to altitudes over 1,000 feet. This includes flying and driving over mountain passes.

2.80 BLOOD DONATION

Divers will not dive for 24 hours after donating blood nor donate blood for 48 hours after diving.

2.90 RECORD KEEPING AND REQUIREMENTS

2.91 Personal Diving Log

Each diver shall maintain a daily record of diving activity. Each diver will maintain daily dive logs for a period of at least three years. The daily dive log will include at least the following:

Name of diver, partner(s), and Lead Diver.

Date, time, and location.

Diving modes used.

General nature of diving activities.

Surface and underwater conditions.

Maximum depths, bottom time and surface interval time.

Diving tables or computers used.

Detailed report of any near or actual incidents.

2.92 Monthly Dive Log

Each diver shall submit a monthly dive log on a form established by the DSB (Appendix 11). Monthly Dive Logs must report all Department dives, as well as those non-Department dives used to maintain the required diving hours. If no dives are made, a monthly dive log showing “no dives” will be submitted.

Divers shall forward a copy of their Monthly Dive Log to the DSO at the end of each month. Logs not received by the tenth day of the following month will be considered delinquent. Divers not submitting logs in a timely manner are subject to de-certification. The Department will maintain logs for a minimum of five years.

2.93 Dive Pay

Divers shall receive diving pay, subject to Department of Personnel Administration (DPA) rules. Only those classifications that are eligible for diving pay as shown on the Department pay scales will receive diving pay. Divers shall be paid only for dives occurring under Department auspices.

A copy of the Monthly Dive Log must be attached to the Monthly Attendance Report (Form FG 681). Dive Pay Time from the Monthly Dive Log must be entered in the "dive pay" box of Form FG 681. Attendance reports including dive pay shall be retained in accordance with personnel document retention schedules.

2.94 Required Incident Reporting

All diving accidents requiring recompression treatment, or resulting in moderate or serious injury, or death, shall be reported to the DSO and AAUS using the form specified by this manual within 48 hours, unless prevented by the circumstances of the incident (Appendix 7). The report will specify the circumstances of the incident and the extent of any injuries or illnesses. Additional information must meet the following reporting requirements:

The Department shall record and report occupational injuries and illnesses in accordance with requirements of the appropriate Labor Code section.

If pressure-related injuries are suspected, or if symptoms are evident, the following additional information shall be recorded and retained by the Department, with the record of the dive, for a period of 5 years:

Complete AAUS Incident Report Form (Appendix 7).

Written descriptive report to include:

Name, address, phone numbers of the principal parties involved.

Summary of experience of divers involved.

Location, description of dive site and description of conditions that led up to incident.

Description of symptoms, including depth and time of onset.

Description and results of treatment.

Disposition of case.

Recommendations to avoid repetition of incident.

The Diving Safety Board shall investigate and document any incident of pressure-related injury and prepare a report which is to be forwarded to the AAUS during the annual reporting cycle.

Minor injuries or potentially hazardous incidents should be reported to the DSO on the Department

Report of Minor Injury form (Appendix 8).

Submitting the above forms is in addition to any other Department requirements for reporting injury or accident.

SECTION 3.00**DIVING EQUIPMENT****3.10 GENERAL POLICY**

All equipment shall meet standards as determined by the Diving Safety Officer and the Diving Safety Board. Equipment shall be used in accordance with safe diving practices and within the manufacturers' specifications. Equipment subjected to extreme use or adverse conditions requires more frequent testing and maintenance.

The Diver shall regularly examine all equipment.

Supervisors shall approve the purchase of all required equipment.

3.20 REQUIRED PERSONAL EQUIPMENT**3.21 Regulator**

Each diver shall have and maintain at least one SCUBA regulator. Regulators will consist of a balanced first stage and a demand valve second stage.

Only those makes and models specifically approved by the Diving Safety Officer and the Diving Control Board shall be used.

Scuba regulators shall be inspected and tested prior to first use and every six months thereafter (Section 3.71).

In addition to the regulator each diver shall have available an alternate breathing gas source. This may include an "octopus" second stage; a buoyancy compensator integrated second stage, or a redundant gas delivery system.

3.22 Breathing Masks and Helmets

Breathing masks and helmets shall have:

A non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.

An exhaust valve.

A minimum ventilation rate capable of maintaining the diver at the depth to which he/she is diving.

3.23 SCUBA Cylinders

Each diver shall maintain a minimum of two single cylinders.

SCUBA cylinders will be designed, constructed, and maintained in accordance with the applicable provisions of the Unfired Pressure Vessel Safety Orders.

Scuba cylinders must be hydrostatically tested in accordance with DOT standards, must have an internal inspection at intervals not to exceed twelve months, and cylinders and cylinder valves shall be functionally tested at intervals not to exceed twelve months (Section 3.72).

3.24 Backpack, Weighting System, and Flotation Device

Each diver shall have a backpack, weighting system, and a flotation device capable of achieving and maintaining positive buoyancy. These items may be integrated.

Backpacks without integrated flotation will have a quick release device designed to permit jettisoning.

Weight belts and integrated weight systems used by divers will be capable of quick one-handed release.

Personal flotation systems, buoyancy compensators, dry suits, or other variable volume buoyancy compensation devices will be equipped with an exhaust valve.

These devices shall be functionally inspected and tested at intervals not to exceed six months (Section 3.74).

3.25 Sound Making Device

Each diver shall have a device capable of audibly signaling for assistance or attention at the surface.

3.26 Facemask

Facemasks will have tempered glass or shatterproof lenses.

Corrective lenses are approved.

3.27 Timing Device, Depth and Pressure Gauges

Each diver shall have an underwater timing device capable of showing dive time and time of day, an approved depth indicator, and a submersible tank pressure gauge.

Gauges shall be inspected and tested before first use and every six months thereafter (Sections 3.73 and 3.75).

3.28 Fins

Each diver shall have at least one pair of fins appropriate for the dive conditions.

3.29 Cutting Tool

Each diver shall have a cutting tool, knife, wire cutters, or EMT scissors as appropriate.

3.30 Snorkel

Each diver shall have one snorkel appropriate for breathing at the surface.

3.31 Compass

Each diver shall have one underwater compass.

3.32 Dive Light

Each diver shall have an underwater light.

3.33 Thermal Protective Suit

Each diver shall have a thermal protective suit (i.e. wetsuit or drysuit) appropriate for the dive location and conditions.

Use of drysuits requires proof of formal training approved by the Diving Safety Board.

3.34 Method of Determination of Decompression Status: Dive Tables, Dive Computers

A set of diving tables, approved by the Diving Safety Board, must be available at the dive location.

Dive computers may be used in place of diving tables if approved by the Diving Safety Board (Appendix 5, Guidelines for Dive Computer Use).

3.40 REQUIRED DIVE TEAM EQUIPMENT

3.41 Diving Flag

When diving in areas capable of supporting marine vessel traffic a rigid replica of the International code flag "A" or appropriate night signal shall be displayed as required by the "Rules of the Road".

The additional use of the recreational diving red and diagonal white stripe flag, “diver down flag”, is recommended.

When diving from shore, or in shallow water in areas of vessel traffic, the “diver down flag” is a minimum requirement.

3.42 Emergency Oxygen Delivery System

Emergency oxygen supply (such as a DAN O₂ Kit) will be available onsite with sufficient supply for the dive location.

3.43 First Aid Supplies.

A first aid kit will be available on site.

3.50 AUXILIARY EQUIPMENT

3.51 Handheld underwater power tools.

Electrical tools and equipment used underwater shall be specifically approved for this purpose. Electrical tools and equipment supplied with power from the surface shall be de-energized before being placed into or retrieved from the water. Handheld power tools shall not be supplied with power from the dive location until requested by the diver.

3.52 Compressor Systems

Low-pressure compressors used to supply air to the diver if equipped with a volume tank will have a check valve on the inlet side, a relief valve, and a drain valve.

Compressed air systems over 500 psig will have slow-opening shut-off valves.

All air compressor intakes will be located away from areas containing exhaust or other contaminants.

3.53 Oxygen Systems

Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen will be designed and maintained for oxygen service.

Components exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen will be cleaned of flammable materials before being placed into service.

Oxygen systems over 125 psig will have slow-opening shut-off valves.

3.60 EQUIPMENT MAINTENANCE

All equipment is to be maintained in a safe operating condition. Divers shall inspect all tools, equipment, and operational systems used in diving operations to insure they are appropriate and in proper working order before diving.

3.61 Record keeping

Each equipment modification, repair, test, calibration, or maintenance service shall be logged, including the date and nature of work performed, serial number of the item, and the name of the person performing the work for the following equipment:

Regulators (including alternate gas sources)

Submersible tank pressure gauges

Depth gauges

SCUBA cylinders

Cylinder valves

Diving helmets

Submersible breathing masks

Compressors

Gas control panels

Air storage cylinders

Air filtration systems

Analytical instruments

Buoyancy control devices

Dry suits

Emergency oxygen delivery systems

3.62 Compressor Operation and Air Test Records

Gas analyses and air tests shall be performed on each breathing air compressor at regular intervals of no more than 100 hours of operation or six months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained.

A log shall be maintained showing operation, repair, overhaul, filter maintenance, and temperature adjustment for each compressor.

3.70 SCHEDULES OF MAINTENANCE

3.71 Regulators

Regulators will be tested every 6 months and perform in accordance with manufacturers standards.

3.72 SCUBA Cylinders

SCUBA cylinders will have an internal visual inspection at intervals not to exceed 12 months.

SCUBA cylinders and valves will be functionally tested at intervals not to exceed 12 months.

SCUBA cylinders will be hydrostatically tested every 5 years in accordance with Department of Transportation (DOT) standards.

3.73 Submersible (Tank) Pressure Gauge

Submersible (tank) pressure gauges will be tested against a master gauge at intervals not to exceed 6 months.

3.74 Buoyancy Compensators

Buoyancy compensation devices must be functionally inspected at intervals not to exceed 6 months.

3.75 Depth Gauges

Each depth gauge will be tested or calibrated every 6 months or when there is reasonable cause to believe a discrepancy exists.

3.76 Dive Computers

Maintenance will be performed in accordance with the manufacturer's specifications.

3.77 Emergency Oxygen Delivery Systems

Regulators: Assemblies will be serviced as recommended by the manufacturer. Regulators subject to recall or believed to be contaminated will immediately be removed from service.

Cylinders: Will be purged and refilled every two years, and will be hydrostatically tested every five years (DOT requirement).

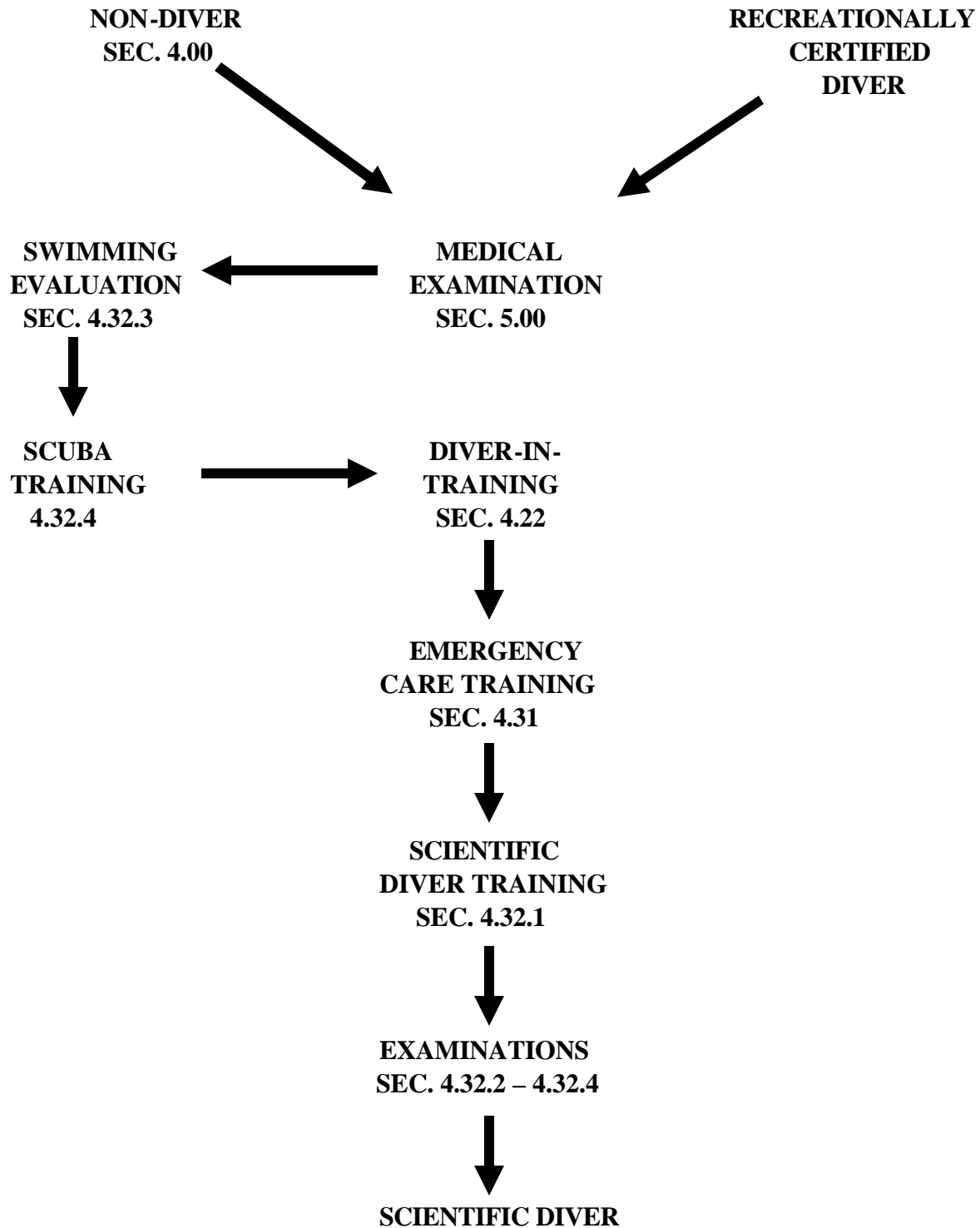
3.80 AIR QUALITY STANDARDS

Breathing air for SCUBA will meet the following specifications as set forth by the Compressed Gas Association (CGA Pamphlet G-7.1) and referenced in OSHA 29 CFR 1910.134

CGA Grade E

Component	Maximum
Oxygen	20 - 22%/v
Carbon Monoxide	10 PPM/v
Carbon Dioxide	500 PPM/v
Condensed Hydrocarbons	5 mg/m ³
Water Vapor	NS
Objectionable Odors	None

DIVER CERTIFICATION FLOW-CHART



SECTION 4.00**DIVER CERTIFICATION****4.10 CERTIFICATION**

Certification in the Department's diving program is limited to employees and volunteers of the Department. Employees of other state agencies may be admitted to the certification course at the option of the DSM, but no certification will be issued to them. The DSO will notify their agency of their successful/unsuccessful completion of the course.

4.20 CERTIFICATION TYPES**4.21 Department Scientific Diver Certification.**

This is the required certification for employees and volunteers to dive under Department auspices for the purpose or in support of scientific research.

4.22 Restricted Certification (Diver in Training).

A supervisor may request, and an employee or volunteer may receive a Restricted Diver Certification, if such a certification is in the interest of the Department. Such a restricted certification will be made available to trained divers with demonstrated experience in a program similar to the Department's diving program. A restricted diver may dive on departmental dives, subject to the following conditions:

This permit signifies that a diver has completed a minimum of 40 hours of training with at least 5 ocean or open water dives, and possesses a nationally recognized diving certificate. The permit shall be granted upon completion of requirements listed in Section 4.30.

The DSO or his/her designee shall evaluate the diver and verify that he/she possesses skills and knowledge substantially similar to those stated in Sections 4.30.

The diver may dive only on the sponsoring project's diving operations, under the supervision of that project's Department certified divers.

Dives are limited to 60 feet, but the restricted diver may receive a 100-foot certification based on need, after application to the DSB. Such an application will be accompanied by records of the required number of dives accompanied by a Department diver holding at least a 100-foot certification.

The restricted diver shall attend the next regularly scheduled Department certification course. In the event that attendance is not possible, as determined by the DSB, the provisional certification may be extended to the next certification course.

The restricted diver will abide by all regulations in this manual.

In addition to the standard certification requirements the restricted diver shall provide:

A written statement from a responsible person documenting the training, qualifications, and experience of the new diver (i.e., university, commercial diving, military, or other scientific organization) including the name of the person and contact information;

A statement from the project leader describing the type of diving environment and duties the restricted diver shall be required to perform (areas, depths, and skill required).

Evaluation procedures will begin after the receipt of the basic application package as specified under the standard certification process. The restricted diver candidate shall be evaluated to the standards of the general certification course. The candidate shall be tested to a depth of 60 feet.

Upon successful completion of the evaluation, the DSB will recommend and the DSM may certify that the candidate receive a restricted certification.

All DSB expenses associated with this restricted certification including per diem will be the responsibility of the project requesting the certification.

4.30 REQUIREMENTS FOR DEPARTMENT DIVER CERTIFICATION

Only a person diving under Department auspices is eligible for Department Certification.

Submission of documents and participation in aptitude examinations does not automatically result in certification. The applicant must demonstrate to the Diving Safety Officer and members of the DSB that he/she is sufficiently skilled and proficient to be certified. The signature of the Diving Safety Manager will acknowledge this skill. Documentation and examinations required are as follows:

4.31 Documents

Application for SCUBA Diver Certification (Appendix 14) signed by the candidate's supervisor and Regional Manager/Division Chief.

Medical approval (Appendix 1, 2, and 3).

Proof of Training. Each applicant shall have passed a nationally recognized open water SCUBA course and provide evidence of experience showing at least 12 hours of dive time in the previous 12 months.

The diver must also provide proof of the following Emergency Care Training:

Cardiopulmonary resuscitation (CPR) (must be current).

Emergency oxygen administration (must be current).

First aid for diving accidents.

Open water dive rescue.

4.32 Evaluation

The certification course will consist of approximately five consecutive days of increasingly technical diving experience and evaluation, under the supervision of the DSB and a qualified SCUBA instructor. During the course, there will be no more than three new divers per SCUBA instructor.

The DSB and the SCUBA instructor must be satisfied that the candidate is able to satisfactorily perform diving operations by observing performance in an appropriate series of qualifying tests.

4.32.1 Training

The diver must have completed additional theoretical aspects and practical training beyond the diver-in-training permit level for a minimum cumulative time of 100 hours.

Theoretical aspects should include principles and activities appropriate to the intended area of scientific study. Suggested topics may include, but are not limited to; cardiopulmonary resuscitation (CPR), diving first aid, oxygen administration, accident management, field neurological exam, dive rescue, recognition of DCS and AGE, data gathering techniques, collecting, common biota, behavior, installation of scientific apparatus, use of chemicals, site selection, site location and relocation, organism identification, ecology, tagging, photography, archaeology, scientific dive planning, coordination with other agencies, appropriate governmental regulations, AAUS scientific diving regulations, small boat operation, theoretical training in diving technology, specialized equipment to be used, blue water diving, diving in confined spaces, zero visibility diving, research vessel diving, aquarium diving, animal handling, polluted water diving, cold water diving, special gas mixes, decompression theory and its application.

4.32.2 Written Examination

Each diver must successfully complete a written examination as prescribed by the DSB (Appendix 13). Examination shall include, but not be limited to the following:

Function, care, use, and maintenance of diving equipment.

Physics and physiology of diving.

Diving regulations and precautions.

Near-shore currents and waves.

Dangerous marine animals.

Emergency procedures, including buoyant ascent and ascent by air sharing.

Currently accepted decompression procedures.

Demonstrate the proper use of dive tables.

Underwater communications.

Aspects of freshwater and altitude diving.

Hazards of breath-hold diving and ascents.

Planning and supervision of diving operations.

Diving hazards.

Cause, symptoms, treatment, and prevention of the following: near-drowning, air embolism, carbon dioxide excess, squeezes, oxygen poisoning, nitrogen narcosis, exhaustion and panic, respiratory fatigue, motion sickness, decompression sickness, hypothermia, and hypoxia/anoxia.

4.32.3 Swimming Evaluation (Pool or Similar Conditions)

Swim 1,200 feet without fins, in less than 9 minutes.

Enter and leave the water, with and without diving gear.

Swim 75 feet continuously under water without fins.

Without the use of swim aids, perform a survival swim for 15 minutes.

Surface dive to a depth of 15 feet, without fins.

Recover a 15-pound weight from 15 feet of water, without fins.

Swim 75 feet with a 15-pound weight on the surface, without fins.

Without the use of swim aids, transport another person of equal or greater size a distance of 75 feet on the surface.

Other items at the discretion of the DSB.

4.32.4 Open Water Evaluation

Enter water with full equipment.

Clear facemask.

Demonstrate air sharing, including both buddy breathing and the use of alternate air source, as both donor and recipient, with and without a facemask.

Demonstrate ability to alternate between snorkel and scuba while kicking.

Demonstrate understanding of underwater signs and signals.

Demonstrate simulated diver recovery and in-water mouth-to-mouth resuscitation.

Rescue and transport, as a diver, a passive simulated victim of an accident.

Demonstrate ability to remove and replace equipment while submerged.

Demonstrate diving ability that is acceptable to the instructor.

Demonstrate skin diving ability and proficiency with use of fins, use of mask, and use of snorkel.

Tow a diver in diving gear 500 feet at the surface.

Swim 1,000 feet in full dive gear in ocean.

Bail Out: With fins, mask, weighting system, and SCUBA (cylinder valve closed) in hands, and other diving gear on, jump off a floating platform. After submerging, don remaining gear in the water.

Ditch and Don: Remove mask, snorkel and SCUBA in 15 feet of water, close cylinder valve, and make a controlled free ascent to the surface; return to the gear on the bottom and put it on; then make a normal ascent to the surface. In addition an extended ditch and don, where the diver swims 15 feet across the bottom before donning gear, must be performed.

Perform other skills as required by the DSB.

4.32.5 Dive Requirements

A minimum of 4 dives and a minimum of 2 hours dive time in water less than 25 feet.

A minimum of 4 dives and a minimum of 2 hours dive time in water deeper than 25 feet.

A minimum of two dives planned and led by each student, and supervised by the DSB and the SCUBA instructor.

Night dives to familiarize candidate with night diving situations.

A portion of the certification course may be devoted to accomplishing tasks which might be required during routine assignments (biological and geological transects, underwater collecting, equipment maintenance, patrol problems, etc.).

Hazardous diving conditions will be simulated, including but not limited to: loss of air; loss of equipment; entanglement in kelp and lines; limited visibility, etc., to simulate conditions, which might arise during a working dive.

Upon successful completion of the certification course and the written examination, the DSO may recommend, and the DSM may certify the individual as a Department diver to a depth of 60 feet.

4.40 DEPTH CERTIFICATIONS

Diving is not permitted beyond a depth of 190 feet.

4.41 Depth Certification Levels

Certification to 30 Foot Depth

This is the initial certification level, approved upon the successful completion of training listed in Section 4.32.

Certification to 60 Foot Depth

A diver holding a 30-foot certificate may be certified to a depth of 60 feet after completing 12 logged dives to depths between 31 and 60 feet, for a minimum total time of 4 hours. A diver holding a 60-foot or greater certification must accompany the diver.

Certification to 100 Foot Depth

A diver holding a 60-foot certificate may be certified to a depth of 100 feet after completing 12 logged dives to depths between 61 and 100 feet, for a minimum total time of 2 hours. A diver holding a 100-foot or greater certification must accompany the diver.

Certification to 130 Foot Depth

A diver holding a 100-foot certificate may be certified to a depth of 130 feet after completing four dives deeper than 100 feet, for a minimum total time of 1 hour. A diver with a 130-foot certification must accompany the diver. This certification will only be issued upon justification of need for job requirements.

Certification to Depths Over 130 Feet

A diver may be certified to a depth of 165 feet after the completion of four dives near each depth and with the specific approval of the DSB. Dives over 130 feet are considered specialized diving mode dives (Sections 6.30-6.34)

Progression to Next Depth Level

A certified diver diving under the Department auspices may exceed his/her depth certification only if accompanied by a diver certified to a greater depth. Under these circumstances the diver may exceed his/her depth limit by one step.

4.50 ANNUAL DIVER RECERTIFICATION:

Each certified diver must pass an annual recertification course, which includes the following:

Swim 1,000 feet without fins, in less than 9 minutes.

Swim 75 feet continuously under water without fins.

Without the use of swim aids, perform a survival swim for 15 minutes.

Swim 75 feet with a 15-pound weight on the surface without fins.

Recover a 15-pound weight from 15 feet of water without fins.

Swim 1,000 feet in full dive gear in the ocean.

Other review items at the discretion of the DSB.

4.60 MAINTENANCE OF CERTIFICATION

4.61 Minimum Activity to Maintain Certification

During a calendar year, each certified scientific diver must log a minimum of 20 dives. A warning shall be issued if a diver fails to complete 10 dives in the first half of a calendar year. At least one dive must be logged near the maximum depth of the diver's certification during each 6 month period. Divers certified to 150 feet or deeper may satisfy these requirements with dives to 130 feet or over. Failure to meet these requirements is cause for revocation, restriction, or lowering of depth of certification.

Divers must complete the annual recertification course (Section 4.50).

Divers must maintain required logs and maintenance records (Sections 2.91, 2.92, 3.61, and 3.62). Monthly logs must be submitted in a timely manner (Section 2.92).

For divers certified to use rebreathers, at least four rebreather dives must be made in a calendar year. A warning shall be issued if the diver fails to make two rebreather dives in the first half of a calendar year.

4.62 Medical Examination

All divers shall pass a medical examination at the intervals specified in Section 5.11. After each major illness or injury, as described in Section 5.11, a diver shall receive clearance to return to diving from a physician before resuming dive activities.

4.70 REVOCATION OF CERTIFICATION

Diving certification may be revoked or restricted for cause by the Diving Safety Officer with the approval of the DSB. The Diving Safety Officer shall inform the diver in writing of the reason(s) for revocation. The diver will be given the opportunity to present his/her case in writing to the Diving Safety Manager for reconsideration and/or recertification. All such written statements and requests, as identified in this section, are formal documents which will become part of the diver's file.

4.80 RECERTIFICATION AFTER LAPSE OR REVOCATION

A diver whose certification has lapsed or been revoked may be recertified upon completion of the following requirements:

The diver's Regional Manager or Branch Chief must make written application to the DSO.

The diver must have a current physical examination on file with the DSO.

The diver must show evidence of current emergency care training as required (Section 4.31).

If the diver's certification has been revoked for cause, the cause of revocation must be corrected to the satisfaction of the DSB.

The diver must complete the standard annual diver recertification course and other skill evaluations as required by the DSB. This includes the possibility of required attendance at a full certification course.

SECTION 5.00**MEDICAL STANDARDS****5.10 MEDICAL REQUIREMENTS****5.11 General**

Prior to acceptance for certification, and every other year thereafter, each diver shall pass a diving physical examination. Results of the examination must be sent to the DSO on forms provided by the Department, including a certificate signed by a physician stating the diver is physically qualified for SCUBA diving (Appendix 1, 2, and 3). The Department will pay reasonable physical examination costs.

The diver should be free of any chronic disabling disease and free of any conditions considered absolute contraindications to diving as determined by a physician trained in diving medicine (Appendix 1).

Any major injury or illness, any condition requiring hyperbaric treatment or any condition requiring hospitalization requires clearance to return to diving from a physician trained in diving medicine.

5.12 Content of Medical Evaluations

Medical examinations conducted initially and at the intervals specified in Section 5.11 will consist of the following:

Completed Applicant Agreement for Release of Medical Information to the Diving Safety Officer and the DSB (Appendix 2).

Completed Diving Medical History Form (Appendix 3)

Completed Diving Physical Examination Form (Section 5.13).

5.13 Information Provided to the Examining Physician

The Department shall provide a copy of the medical evaluation requirements of this standard to the examining physician (Appendices 1, 2, and 3).

5.14 Conditions Which May Disqualify Candidates from Diving

The conditions listed in Appendix 1 (Diving Medical Exam Overview for the Examining Physician) may disqualify candidates from diving and should be considered by the examining physician.

5.15 Laboratory Requirements for Diving Medical Examination:

The laboratory examinations tests listed in Appendix 2 (Medical Evaluation of Fitness for SCUBA Diving Report) are required for initial and subsequent medical examinations. Additional requirements are indicated for divers over age forty.

5.16 Physician's Written Report

After any medical examination relating to an individual's fitness to dive, the Department shall obtain a written report prepared by the examining physician, which shall contain the examining physician's opinion of the individual's fitness to dive, including any recommended restrictions or limitations (Appendix 2). This will be reviewed by the DSB.

The Department shall make a copy of the physician's written report available to the individual.

SECTION 6.00

SPECIALIZED DIVING MODES

6.10 GENERAL

6.11 Specialized Diving Modes Defined

The following dives are considered specialized diving modes:

Conducted to depths over 130 feet

Requiring staged decompression

Conducted in a restricted overhead environment (cavern, cave, tunnel, ice, or shipwreck penetration)

Conducted in bluewater (open ocean, with bottom depth deeper than diver's certified depth)

Incorporating breathing gas mixtures other than air

Involving delivery systems other than self-contained, open circuit systems (SCUBA)

Using a drysuit

Conducted at altitudes over 1,000 feet

Conducted in swiftwater

Tended or tethered diving

Light maintenance dives

Conducted in petroleum contaminated water

Conducted in any other particularly hazardous environments

6.12 Prior Approval Required

Application to and approval by the DSO and/or additional training are required in order to use a specialized diving mode. The DSO may include further requirements for the use of specialized diving modes other than those listed in this chapter.

6.20 NITROX DIVING

The Diving Safety Program understands the potential benefits to Department divers who use NITROX (also known as Enriched Air NITROX (EAN), EANx, SafeAir, etc.) for SCUBA dives. Generally speaking, NITROX is a gas mixture of Nitrogen and Oxygen where the Oxygen content is higher than 20.9 percent.

The following guidelines address the use of nitrox by scientific divers under Department.

6.21 Prerequisites

6.21.1 Eligibility

Only a certified Scientific Diver (Section 4) diving under Department auspices is eligible for authorization to use nitrox. After completion, review and acceptance of application materials, training and qualification as per these guidelines, an applicant will be authorized to use nitrox within his/her depth authorization.

6.21.2 Requirements for Authorization to Use Nitrox

Submission of documents and participation in aptitude examinations does not automatically result in authorization to use nitrox. The applicant must convince the DSO and members of the DSB that he/she is sufficiently skilled and proficient. The signature of the DSO on the authorization form will acknowledge authorization. After completion of training and evaluation, authorization to use nitrox may be denied to any diver who does not demonstrate to the satisfaction of the DSO or DSB the appropriate judgment or proficiency to ensure the safety of the diver and dive buddy.

Prior to authorization to use nitrox, the following minimum requirements should be met:

6.21.3 Training

The diver must complete additional theoretical and practical training beyond the Scientific Diver certification level, to the satisfaction of the DSO and DSB (Section 6.22).

6.21.4 Examinations

Each diver should demonstrate proficiency in skills and theory in written, oral, and practical examinations covering:

Written examinations covering the information presented in the classroom training session(s) (i.e., gas theory, oxygen toxicity, and partial pressure determination).

Practical examinations covering the information presented in the practical training session(s) (i.e., gas analysis and documentation procedures).

Openwater checkout dives, to appropriate depths, to demonstrate the application of theoretical and practical skills learned.

6.21.5 Minimum Activity to Maintain Authorization

The diver should log at least one (1) nitrox dive per year. Failure to meet the minimum activity level may be cause for restriction or revocation of nitrox authorization.

6.22 Nitrox Training Guidelines

Training in these guidelines should be in addition to Scientific Diver (Section 4.00).

6.22.1 Classroom Instruction

Topics should include, but are not limited to: review of previous training; physical gas laws pertaining to nitrox; partial pressure calculations and limits; equivalent air depth (EAD) concept and calculations; oxygen physiology and oxygen toxicity; calculation of oxygen exposure and maximum safe operating depth (MOD); determination of decompression schedules (both by EAD method using approved air dive tables, and using approved nitrox dive tables); dive planning and emergency procedures; mixing procedures and calculations; gas analysis; personnel requirements; equipment marking and maintenance requirements; dive station requirements.

The DSB may choose to limit standard nitrox diver training to procedures applicable to diving, and subsequently reserve training such as nitrox production methods, oxygen cleaning, and dive station topics to divers requiring specialized authorization in these areas.

6.22.2 Practical Training

The practical training portion will consist of a review of skills as stated for SCUBA (Section 4.00), with additional training as follows:

Oxygen analysis of nitrox mixtures.

Determination of MOD, oxygen partial pressure exposure, and oxygen toxicity time limits, for various nitrox mixtures at various depths.

Determination of nitrogen-based dive limits status by EAD method using air dive tables, and/or using nitrox dive tables, as approved by the DCB.

Nitrox dive computer use may be included, as approved by the DCB.

6.22.3 Written Examination (based on classroom instruction and practical training)

Before authorization, the trainee should successfully pass a written examination demonstrating knowledge of at least the following:

Function, care, use, and maintenance of equipment cleaned for nitrox use.

Physical and physiological considerations of nitrox diving (e.g. O₂ and CO₂ toxicity).

Diving regulations and procedures as related to nitrox diving, either scuba or surface-supplied (depending on intended mode).

Given the proper information, calculation of:

Equivalent air depth (EAD) for a given fO₂ and actual depth.

pO₂ exposure for a given fO₂ and depth.

Optimal nitrox mixture for a given pO₂ exposure limit and planned depth.

Maximum operational depth (MOD) for a given mix and pO₂ exposure limit.

For nitrox production purposes, percentages/psi of oxygen present in a given mixture, and psi of each gas required to produce a fO₂ by partial pressure mixing.

Decompression table and dive computer selection and usage.

Nitrox production methods and considerations.

Oxygen analysis.

Nitrox operational requirements (Section 6.28), dive planning, and dive station components.

6.22.4 Openwater Dives

A minimum of two supervised openwater dives using nitrox should be required for authorization. The mode used in the dives should correspond to the intended application (i.e., scuba or surface-supplied). If the MOD for the mix being used can be exceeded at the training location, direct, in-water supervision is required.

6.22.5 Surface-Supplied Training

All training as applied to surface-supplied diving (practical, classroom, and openwater) will follow the Department's surface-supplied diving standards, including additions listed in Section 6.60.

6.23 Nitrox Diving Personnel Requirements

6.23.1 Nitrox Diver in Training

A Diver in Training, who has completed the requirements of Section 4.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox under the direct supervision a Scientific Diver who also holds nitrox authorization. Dive depths should be restricted to those specified in the diver's authorization.

6.23.2 Scientific Diver

A Scientific Diver, who has completed the requirements of Section 4.00 and the training and authorization sections of these guidelines, may be authorized by the DSO to use nitrox. Depth authorization to use nitrox should be the same as those specified in the diver's authorization.

6.23.3 Lead Diver

On any dive during which nitrox will be used by any team member, the Lead Diver should be authorized to use nitrox, and hold appropriate authorizations required for the dive. Lead Diver authorization for nitrox dives by the DSO should occur as part of the dive plan approval process.

In addition to responsibilities listed in Section 2.42, the Lead diver should:

As part of the dive planning process, verify that all divers using nitrox on a dive are properly qualified and authorized.

As part of the pre-dive procedures, confirm with each diver the nitrox mixture the diver is using, and establish dive team maximum depth and time limits, according to the shortest time limit or shallowest depth limit among the team members.

The Lead Diver should also reduce the maximum allowable pO₂ exposure limit for the dive team if on-site conditions so indicate (Section 6.24).

6.24 Nitrox Dive Parameters

6.24.1 Oxygen Exposure Limits

The inspired oxygen partial pressure experienced at depth should not exceed 1.6 ATA. All dives performed using nitrox breathing mixtures should comply with the current *NOAA Diving Manual* "Oxygen Partial Pressure Limits for 'Normal' Exposures".

The maximum allowable exposure limit should be reduced to 1.5 ATA in cases where cold or strenuous dive conditions, or extended exposure times are expected. The DSO should consider this in the review of any dive plan application that proposes to use nitrox. The Lead Diver

should also review on-site conditions and reduce the allowable pO₂ exposure limits if conditions indicate.

If using the equivalent air depth (EAD) method the maximum depth of a dive should be based on the oxygen partial pressure for the specific nitrox breathing mix to be used.

6.24.2 Bottom Time Limits

Maximum bottom time should be based on the depth of the dive and the nitrox mixture being used.

Bottom time for a single dive should not exceed the NOAA maximum allowable “Single Exposure Limit” for a given oxygen partial pressure, as listed in the current NOAA Diving Manual.

6.24.3 Decompression Tables and Gases

A set of DSO approved nitrox decompression tables should be available at the dive site.

When using the equivalent air depth (EAD) method, dives should be conducted using air decompression tables approved by the DSO.

If nitrox is used to increase the safety margin of air-based dive tables, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.

Breathing mixtures used while performing in-water decompression, or for redundant gas delivery purposes, should contain the same or greater oxygen content as that being used during the dive, within the confines of depth limitations of this section.

6.24.4 Nitrox Dive Computers

Dive computers approved by the DSO may be used to compute decompression status during nitrox dives. Manufacturers’ guidelines and operations instructions should be followed.

Use of Nitrox dive computers should comply with dive computer guidelines included in this manual (Appendix 5).

Nitrox dive computer users should demonstrate a clear understanding of the display, operations, and manipulation of the unit being used for nitrox diving prior to using the computer, to the satisfaction of the DSO or his/her designee.

If nitrox is used to increase the safety margin of an air-based dive computer, the MOD and oxygen exposure and time limits for the nitrox mixture being dived should not be exceeded.

The diver should check dive computers capable of pO₂ limit and fO₂ adjustment prior to the

start of each dive to assure compatibility with the mix being used.

6.24.5 Repetitive Diving

Repetitive dives using nitrox mixtures should be performed in compliance with procedures required of the specific dive tables used.

Residual nitrogen time should be based on the EAD for the specific nitrox mixture to be used on the repetitive dive, and not that of the previous dive.

The total cumulative exposure (bottom time) to a partial pressure of oxygen in a given 24-hour period should not exceed the current *NOAA Diving Manual* 24-hour Oxygen Partial Pressure Limits for 'Normal' Exposures.

When repetitive dives expose divers to different oxygen partial pressures from dive to dive, divers should account for accumulated oxygen exposure from previous dives when determining acceptable exposures for repetitive dives. Both acute (CNS) and chronic (pulmonary) oxygen toxicity concerns should be addressed.

6.24.6 Oxygen Parameters

Authorized Mixtures

Mixtures meeting the criteria outlined in this section may be used for nitrox diving operations, upon approval of the DSO.

Purity

Oxygen used for mixing nitrox breathing gas should meet the purity levels for "Medical Grade" (U.S.P.) or "Aviator Grade" standards.

In addition to the Air Quality Standards (Section 3.80), the following standard should be met for breathing air that is either

Placed in contact with oxygen concentrations greater than 40%, or

Used in nitrox production by the partial pressure mixing method with gas mixtures containing greater than 40% oxygen as the enriching agent:

Air Purity:	CGA Grade E (AAUS Sec. 3.60)
Condensed Hydrocarbons:	500mg/m ²
HydroCarbon Contaminants:	No greater than 0.1 mg/m ³

6.25 Gas Mixing and Analysis

6.25.1 Personnel Requirements

Individuals responsible for producing and/or analyzing nitrox mixtures should be knowledgeable and experienced in all aspects of the technique.

Only those individuals approved by the DSO should be responsible for mixing and/or analyzing nitrox mixtures.

6.25.2 Production Methods

It is the responsibility of the DSB to approve the specific nitrox production method used.

6.25.3 Analysis Verification by User

It is the responsibility of each diver to analyze prior to the dive the oxygen content of his/her scuba cylinder and acknowledge in writing the following information for each cylinder: fO₂, MOD, cylinder pressure, date of analysis, and user's name.

Individual dive log reporting forms should report fO₂ of nitrox used, if different than 21%.

6.26 Nitrox Diving Equipment

All of the designated equipment and stated requirements regarding scuba equipment required in this manual should apply to nitrox scuba operations. Additional minimal equipment necessary for nitrox diving operations includes:

Labeled SCUBA Cylinders

Oxygen Analyzers

6.26.1 Oxygen Cleaning and Maintenance Requirements

All equipment that is exposed to concentrations greater than 40% oxygen at pressures above 150 psig during the dive or cylinder filling process should be cleaned and maintained for oxygen service.

This should include the following equipment: scuba cylinders, cylinder valves, scuba and other regulators, cylinder pressure gauges, hoses, diver support equipment, compressors, and fill station components and plumbing.

6.26.2 Equipment Requirements

Department divers using NITROX mixtures containing greater than 40% Oxygen shall use cylinders and regulators that are cleaned, dedicated, and marked for oxygen use.

Cylinders used for NITROX mixtures containing 21% to 41% Oxygen will be cleaned and dedicated for NITROX use.

Scuba Cylinder Identification Markings

Scuba cylinders to be used with nitrox mixtures should have the following identification documentation affixed to the cylinder:

Cylinders should be marked “NITROX”, or “EANx”, or “Enriched Air”

Nitrox identification color-coding should include a 4-inch wide green band around the cylinder, starting immediately below the shoulder curvature. If the cylinder is not yellow, the green band should be bordered above and below by a 1-inch yellow band.

The alternate marking of a yellow cylinder by painting the cylinder crown green and printing the word “NITROX” parallel to the length of the cylinder in green print is acceptable.

Other markings that identify the cylinder as containing gas mixes other than air may be used with the approval of the DSO.

A contents label should be affixed, to include the current fO₂, date of analysis, and MOD.

The cylinder should be labeled to indicate whether the cylinder is prepared for oxygen or nitrox mixtures containing greater than 40% oxygen.

Regulators

Regulators to be used with nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service, and marked in an identifying manner.

Other Support Equipment

An oxygen analyzer is required which is capable of determining the oxygen content in the scuba cylinder. Two analyzers are recommended to reduce the likelihood of errors due to a faulty analyzer. The analyzer should be capable of reading a scale of 0 to 100% oxygen, within 1% accuracy.

All diver and support equipment should be suitable for the fO₂ being used.

Compressor system

The compressor/filtration system MUST produce oil-free air.

An oil-lubricated compressor placed in service for a nitrox system should be checked for oil and hydrocarbon contamination at least quarterly.

Fill Station Components

All components of a nitrox fill station that will contact nitrox mixtures containing greater than 40% oxygen should be cleaned and maintained for oxygen service. This includes cylinders, whips, gauges, valves, and connecting lines.

6.27 Training Requirements

All divers using NITROX for Department dives shall provide the DSB with proof of completing a training certification course by a recognized NITROX training agency.

All courses shall, at a minimum include training in gas mixture analysis, oxygen toxicity, equivalent air depth (EAD), maximum operating depth (MOD), and the physics of gas partial pressures.

6.28 Operational Requirements

The Department has established the maximum partial pressure of Oxygen at 1.6 ATA. Arduous and/cold water dives shall drop the maximum Oxygen partial pressure to 1.5 ATA.

All Department divers shall be responsible for analyzing their own NITROX mixtures prior to use.

The diver must label cylinders with the Oxygen content and MOD, as well as cylinder pressure, and date of the analysis.

Department divers using NITROX shall not exceed their ACTUAL depth certification unless accompanied by a diver with a deeper certification as provided in the Department Diving Safety Manual.

When diving with NITROX at elevations greater than 1000 feet, divers should calculate profiles based on altitude adjustments first, then augment with the NITROX EAD.

Divers using NITROX for Department dives shall submit the Diving with NITROX Form to the DSO (Appendix 10).

6.30 STAGED DECOMPRESSION DIVING

Staged decompression diving shall be defined as any diving during which the diver cannot make a direct ascent to the surface without performing a required decompression stop to allow the release of inert gas from the diver's body.

6.31 Dives Shallower than 130 Feet

Staged Decompression dives performed shallower than 130 feet shall only be made with prior

approval of the Diving Safety Board. They must also meet the requirements of this section.

6.32 Dives Deeper than 130 Feet

Divers must be able to justify operational necessity for dives deeper than 130 feet.

All dives greater than 130 feet will be considered staged decompression diving. The training, equipment and operational requirements for staged decompression diving (Sections 6.33-35) must be followed. Before the dives occur, the diver must show appropriate competence to work at depth in a hyperbaric chamber test.

Dives deeper than 150 feet will be considered on an individual basis. Due to the training and gear requirements of dives deeper than 150 feet, however, an explanation of why alternative resources (such as contracted commercial divers) are not being used must be submitted to and approved by the DSO.

6.33 Training Requirements

Divers shall document training in staged decompression diving appropriate for the conditions in which dive operations are to be conducted. Such documentation shall be to the satisfaction of the DSO. Training shall be conducted by agencies or instructors approved by the DSO.

Divers shall demonstrate to the satisfaction of the DSB or its designee, proficiency in planning and executing staged decompression dives appropriate to the conditions in which diving operations are to be conducted.

6.34 Equipment Requirements

Cylinder, valve, regulator, and pressure gauge systems will be configured in a redundant manner that allows continuous breathing gas delivery in the event of failure of any one component of the system.

Redundancy in the following components is desirable and may be required at the discretion of the DSO:

Dive Computers or Decompression Calculation Devices

Dive Timing Devices

Depth Gauges

Buoyancy Control Devices

6.35 Operational Requirements

Staged decompression dives will be planned using tables or dive computers at least as conservative as the U.S. Navy Standard Air Decompression Table.

Breathing gas supply needs will be estimated for each diver based on historic diver respiratory minute volume, with allowances for exertion and stress. Such information will be provided as part of the dive plan application.

At least one-third of the gas supply will be reserved for emergencies. Except in the event of an emergency, all divers shall surface with at least one-third of the gas supply remaining.

Decompression gas will be available in twice the estimated amount needed for a full staged decompression schedule.

Breathing gases used while performing in-water decompression will contain the same or greater oxygen content as that used during the dive.

The Dive Team Leader will establish personnel requirements and duties for the following roles in the dive team:

Boat Captain

Diving Supervisor

Diver Tender (if surface supplied mode is used)

Safety Diver(s)

Project Diver(s)

If breathing gas mixtures other than air are used for staged decompression, their use will be in accordance with those regulations set forth in the appropriate sections of this manual.

Emergency procedures approved by the DSO for loss of gas supply, equipment malfunction, unexpected conditions, or dive team separation must be developed and included in the application. Divers will review emergency procedures prior to each diving day.

6.40 RESTRICTED OVERHEAD ENVIRONMENTS

Restricted overhead environments include any diving environment in which a direct ascent to the surface is impeded by a physical barrier, including cave, cavern, ice and shipwreck penetration. It does not include underwater arches, lava tubes, opened shipwrecks or kelp forests, in which:

Two divers can easily swim abreast

There is no significant danger of entrapment or entanglement

Loss of visibility due to siltation is unlikely

6.41 Training Requirements

Divers shall document training in restricted overhead environment diving appropriate for the conditions in which dive operations are to be conducted.

Divers shall demonstrate to the satisfaction of the DSO or a designee, proficiency in planning and executing dives in a restricted overhead environment appropriate to the conditions in which diving operations are to be conducted.

6.42 Equipment Requirements

Divers shall employ a continuous guideline from a point outside the restricted overhead environment to their position.

Divers shall use redundant breathing gas systems while in restricted overhead environments (as in 6.34).

Each diver shall carry a minimum of three lights.

Redundant breathing gas delivery systems will be designed such that no single component failure can prevent access by the diver to an appropriate breathing gas supply.

An alternate second stage will be included with a hose of adequate length to facilitate emergency gas sharing while swimming in a single file formation.

The DSO may require redundancy in other equipment systems to ensure dive team safety, including:

Dive Computers or Decompression Calculation Devices

Dive Timing Devices

Depth gauges

Buoyancy Control Devices

6.43 Operational Requirements

Divers shall immediately exit a restricted overhead environment when a light source or a required piece of equipment fails or malfunctions.

Divers shall begin exiting the overhead environment when any member of the dive team reaches two-thirds of his/her starting primary breathing gas supply.

Where an enclosed or confined space is not large enough for two divers, a diver shall be stationed at the underwater point of entry, an orientation line shall be used, and an emergency breathing gas supply will be available at the point of entry.

Emergency procedures for loss of gas supply, equipment malfunction, team separation, unexpected diving conditions and loss of visibility must be developed. The divers must review emergency procedures prior to each dive.

6.50 BLUEWATER DIVING

Bluewater diving is defined as diving conducted in any body of water in which there is no physical bottom within diving depth ranges. The following regulations have been derived from, *Bluewater Diving Guidelines* (Heine, J.N., Ed., 1986. California Sea Grant College Program Publication No. T-CSGCP-014.) Exceptions to this may be made on a case-by-case basis, if a risk of diver entanglement with other structures exists, or when there are other means of physical control. Procedures for diver control and communication must be developed to the satisfaction of the DSO.

6.51 Training Requirements

The diver shall complete practical training in bluewater diving techniques, and demonstrate proficiency to the satisfaction of the DSO or a designee. This training shall include:

Bluewater diving equipment deployment

Entry procedures

Buoyancy control and awareness

Diver communication

Out-of-air procedures

Dangerous marine life defensive techniques

Exit procedures

Entanglement procedures

Emergency communication and protocols

6.52 Equipment Requirements

Divers shall employ a down-line and counterweighted trapeze line system in order to maintain diver contact and depth control.

The total weight in water of the down-line and tether array will be no greater than 10 pounds.

All diver tether attachments will be made with connectors that can be quickly released by the diver while the line is under a tension at least equivalent to the weight of the entire array.

Attachments must be to either the diver's buoyancy compensator, or to a separate harness, but not to the diver's weight belt.

6.53 Operational Requirements

A safety diver shall be stationed at the trapeze attachment point. This diver's functions are monitoring and controlling the dive team, and monitoring the diving environment for potential hazards. This diver shall be authorized to terminate diving operations for any or all members of the dive team.

A lookout/boat operator shall be stationed aboard any vessel from which bluewater diving is conducted as long as divers are in the water.

6.60 SURFACE-SUPPLIED DIVING

Surface-supplied dives will comply with all SCUBA diving procedures in this manual. This includes applicable regulations listed elsewhere in this chapter (Staged Decompression, EAN, etc.).

Divers using the surface-supplied mode shall be equipped with a diver-carried independent reserve breathing gas supply.

Divers using the surface-supplied mode shall maintain voice communication with the surface tender.

Each surface-supplied diver shall be tended by a separate dive team member while in the water.

In the case of a tethered diver with direct communication to the surface, the buddy may be a fully suited diver, prepared to assist.

6.61 Training Requirements

Divers shall satisfy the DSO that they possess the required training, skills, and knowledge to conduct surface-supplied operations.

6.62 Equipment Requirements

Specific equipment requirements will be reviewed and defined by the DSO on a case-by-case basis. Equipment maintenance, repair, and record keeping will comply with the requirements of this manual.

6.63 Operational Requirements

While in the water, each diver shall be assisted by a separate trained tender.

The surface-supplied breathing gas supply must be sufficient to support all surface-supplied divers in the water for the duration of the planned dive, including decompression, as well as providing for emergencies.

During operations when only one surface-supplied diver is in the water, there must be a fully equipped standby diver in attendance at the dive location.

6.70 LIGHT MAINTENANCE DIVING

6.71 Operational Requirements

Job Hazard Analysis (JHA) - Before undertaking any underwater task, a Job Hazard Analysis (JHA) shall be performed. The purpose of the Job Hazard Analysis is to identify hazards associated with each step of a job, and to develop solutions that will either eliminate or guard against the hazard. Required portions of the JHA are:

Sequence of Basic Job Steps

Potential Hazards

Safe Procedures and Protection

Responsibility Assignments

Personnel Assignments

Underwater Hazards including, but not limited to:

Potential for diver fouling or entrapment

Differential pressure hazards including but not limited to underwater discharges, dredging, major intakes, pumps, sluices, suctions or valve culverts.

Hazardous energy situations including but not limited to active cathodic protection, high intensity sonar, propellers, pumps, vessels, or any mechanical apparatus whose inadvertent operation would be hazardous to the diver.

All such devices shall be deactivated and their controls tagged prior to the commencement of the diving operation.

Diving in contaminated liquid, including but not limited to chemical, microbiological, or radiological contamination or any thermal or toxic threat to the diver.

Limited access or penetration situations such as entering a pipe, tunnel, wreck, or similarly enclosed or confining structure (other than a habitat).

These situations shall require an underwater tender at the point of entry and that divers are equipped with an appropriate diver-carried reserve gas breathing supply

Operations involving explosives

The JHA should be reviewed and updated periodically whenever new equipment products, or procedures are introduced into the work site. This is especially true if an accident has occurred.

Decompression Chambers are required for any Light Maintenance dive in excess of 80 fsw or requiring stage decompression. On site chambers must have a minimum capability of compression to 6 ATA (equivalent to 165 fsw).

Stand-by Divers, when assigned, will be on deck, suitably equipped, and ready to dive.

A Diver-Carried Reserve Breathing Supply must be provided when diving deeper than 60 fsw, on dives requiring decompression regardless of depth, when direct ascent to the surface is not available, or when bell diving, except where heavy gear is worn.

A diver-carried reserve breathing gas supply shall supply a physiologically appropriate mixture for the depths involved.

Diver-carried reserve breathing gas supplies must provide a positive indication to the diver that his reserve has been actuated. Such an indication can be the requirement for the diver to open a valve, a visual signal or other appropriate methods.

The diver-carried reserve breathing gas supply shall be of sufficient duration for use until the diver can reach the surface, reach another source of breathing media or be reached by the standby diver equipped with another source of breathing media.

In all cases the activation of a diver-carried reserve breathing gas supply shall cause the dive to be aborted. The reason for activation of the diver's reserve must be ascertained and corrected prior to continued use of the involved equipment.

Two-way Audio Communications between the diver and tender shall be used on Light Maintenance dives. Audio-communication is not required for SCUBA operations, where the team may use either safety line pull signals when diving tethered, or an in-water buddy team.

ANSI approved Personal Protective Equipment shall be worn when required. These items include but are not limited to: protective head gear, protective foot-wear, protective eye-wear, personal flotation devices, hearing protection, harness with approved double locking elastic lanyard, and respiratory equipment.

6.80 PETROLEUM CONTAMINATED WATER DIVES

All diving operations in a petroleum contaminated environment will be conducted as part of the standard Incident Command System, incorporating a Diving Operations function at an organizational level appropriate to the incident size. Refer to the *OIL SPILL FIELD OPERATIONS GUIDE*, ICS-OS-420-1. This is not a guideline for diving in biologically or chemically hazardous conditions.

6.81 Operational Requirements

Prior to conducting the dive the following will be obtained and/or completed:

The type of pollutant and the Material Safety Data Sheet (MSDS)

Ensure that active discharge (under pressure) has stopped = the source controlled

Identification of the chemical hazards and precautions, see MSDS

Determine who controls vessel operations and the operation of any suspect vessel and / or equipment (valves, screens, gates or other mechanical hazards)

Completion of the Sight Safety Plan and the Medical Plan

Notify the appropriate Department Industrial Hygienist.

Based on the above information the dive team leader will submit a dive plan to the Incident Command for approval and incorporation into the Incident Action Plan. The following points should be considered in the dive plan:

Response vessel operations

Ensure that all in/under water equipment on the subject vessel or location are secured (shut off/down). For a commercial vessel or vessel subject to pilotage have the Master or Watch Officer fly the alpha code flag and note so in the ships log. For storm drain discharges have the operator "Lock out and Tag" all automatic or manually activated pumps, gates and valves

Contaminated diver procedures

Dive purpose and activities

Known hazards and procedures to avoid contamination

When enforcement (WPD) is conducting covert or otherwise secret operations exceptions to the above may be made providing that:

A dive plan is still formulated and encompasses the above listed hazards and safety considerations.

Personal or public safety must not be jeopardized to perform the operation.

When an Incident Command System is not in place (such as in a Natural Resource Damage Assessment) it must be activated prior to diving.

6.90 CLOSED CIRCUIT REBREATHERS

Closed-circuit underwater breathing apparatus (CCUBA), or rebreathers, are defined as any device that re-circulates some or all of the exhaled gas in a breathing loop and returns it to the diver.

The Draeger LAR V is the only rebreather approved for use by Department divers, at this time. It is only approved for marine mammal capture activities, associated training, and proficiency dives.

6.91 Training Requirements

Specific training requirements for rebreather use will be defined by the DSO. General requirements are as follows:

SCUBA certification and active status as a Diver are required. Divers must have completed a minimum of 100 open-water dives on SCUBA prior to engaging in rebreather diving activity.

Training in use of Enriched Air NITROX, in accordance with the manual, is required.

Satisfactory completion of a rebreather-training program authorized by the manufacturer or equivalent training approved by the DSO must be demonstrated.

Divers must demonstrate to the DSO or a designee proficiency in pre-dive, dive, and post-dive operational procedures for the particular model of rebreather to be used. Skills must include, at minimum, oxygen control system calibration and verification, carbon dioxide absorbent canister packing, and system monitoring.

Divers must demonstrate to the DSO or a designee proficiency in bailout procedures, including problem recognition, manual system control, flooded breathing loop recovery, absorbent canister failure, and alternate bailout options.

If the rebreather is to be serviced and maintained by the diver, the diver must demonstrate to the DSO or a designee proficiency in proper system maintenance, including full breathing loop disassembly and cleaning (mouthpiece, check-valves, hoses, counterlung, absorbent canister, etc.), oxygen sensor change out, and other tasks required by specific rebreather models.

Diving experience with the particular model of rebreather to be used will include a minimum of 25 hours underwater, of which at least 20 hours will have been in open-water conditions, and at least 5 dives to the proposed operating depth.

Rebreather dives involving operational depths in excess of 100 feet (20 feet for the LAR V) are subject to additional training requirements.

6.92 Operational Requirements

All dives involving rebreathers must comply with operational requirements for SCUBA dives to equivalent depths. In addition, rebreather divers must comply with the following minimum operational requirements:

6.93 General Operational Requirements

The oxygen partial pressure in the breathing gas shall not exceed 1.6 atmospheres at depths greater than 20 feet.

Rebreather equipment shall be used and maintained in accordance with the specifications of the manufacturer, including pre- and post-dive procedures and operational limits (e.g., depth, water temperature, etc.).

All rebreather divers shall have at their disposal an alternate means to return to the surface in the event of a catastrophic, unrecoverable breathing loop failure (e.g., a second rebreather system, or sufficient open-circuit gas supply).

If the buddy of a rebreather diver is using SCUBA, the rebreather must be equipped with a means to provide the SCUBA diver with a sufficient supply of open-circuit breathing gas to allow both divers to return safely to the surface.

For specific operational requirements refer to the Draeger LAR V operational manual.

APPENDIX 1**DIVING MEDICAL EXAM OVERVIEW FOR THE EXAMINING PHYSICIAN**

TO THE EXAMINING PHYSICIAN:

This person, _____, requires a medical examination to assess their fitness for certification as a Scientific Diver for the California Department of Fish and Game. His /her answers on the Diving Medical History Form (attached), may indicate potential health or safety risks as noted. Your evaluation is requested on the attached SCUBA Diving Fitness Medical Evaluation Report. If you have questions about diving medicine, you may wish to consult one of the references on the attached list. Please contact the undersigned Diving Safety Officer if you have any questions or concerns about diving medicine or the California Department of Fish and Game standards. Thank you for your assistance.

Diving Safety Officer_____
Date_____
Printed Name_____
Phone Number

SCUBA and other modes of compressed-gas diving can be strenuous and hazardous. A special risk is present if the middle ear, sinuses or lung segments do not readily equalize air pressure changes. The most common cause of distress is Eustachian insufficiency. Most fatalities involve deficiencies in prudence, judgement, emotional stability or physical fitness. Please consult the following list of conditions that usually restrict candidates from diving.

(Adapted from Bove, 1998. bracketed numbers are pages in Bove)

1. Abnormalities of the tympanic membrane, such as perforation, presence of a monomeric membrane, or inability to autoinflate the middle ears.[5,7,8,9]
2. Vertigo including Meniere's Disease.[13]
3. Stapedectomy or middle ear reconstructive surgery.[11]
4. Recent ocular surgery.[15,18,19]
5. Psychiatric disorders including claustrophobia, suicidal ideation, psychosis, anxiety states, untreated depression.[20-23]
6. Substance abuse, including alcohol.[24-25]
7. Episodic loss of consciousness.[1,26,27]
8. History of seizure.[27,28]
9. History of stroke or a fixed neurological deficit.[29,30]
10. Recurring neurologic disorders, including transient ischemic attacks.[29,30]
11. History of intracranial aneurysm, other vascular malformation or intracranial hemorrhage.[31]
12. History of neurological decompression illness with residual deficit.[29,30]
13. Head injury with sequelae.[26,27]
14. Hematologic disorders including coagulopathies.[41,42]
15. Evidence of coronary artery disease or high risk for coronary artery disease¹. [33-35]
16. Atrial septal defects.[39]
17. Significant valvular heart disease – isolated mitral valve prolapse is not disqualifying.[38]
18. Significant cardiac rhythm or conduction abnormalities.[36-37]
19. Implanted cardiac pacemakers and cardiac defibrillators (ICD).[39,40]
20. Inadequate exercise tolerance.[34]
21. Severe hypertension.[35]
22. History of spontaneous or traumatic pneumothorax.[45]
23. Asthma². [42-44]

24. Chronic pulmonary disease, including radiographic evidence of pulmonary blebs, bullae or cysts.[45,46]
25. Diabetes mellitus.[46-47]
26. Pregnancy.[56]

¹ “Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations.” Grundy et al. 1999. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>

² “Are Asthmatics Fit to Dive?” DH Elliot, ed. 1996. Undersea Hyperbaric Medical Society, Kensington, MD.

SELECTED REFERENCES IN DIVING MEDICINE

Most of these are available from Best Publishing Company, P.O. Box 30100, Flagstaff, AZ 86003-0100, the Divers Alert Network (DAN), or the Undersea and Hyperbaric Medical Association (UHMS), Bethesda, MD.

ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology / American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). RJ Gibbons, et al. 1997. Journal of the American College of Cardiology. 30:260-311.
<http://www.acc.org/clinical/guidelines/exercise/exercise.pdf>

Alert Diver Magazine; Articles on diving medicine
<http://www.diversalertnetwork.org/medical/articles/index.asp>

“Are Asthmatics Fit to Dive?” DH Elliot, ed. 1996. Undersea Hyperbaric Medical Society, Kensington, MD.

“Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations.” Grundy et al. 1999. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>

Diving Medicine, Third Edition, 1997. A. Bove and J. Davis. W.B. Saunders Company, Philadelphia.

Diving and Subaquatic Medicine, Third Edition, 1994. C. Edmonds, C. Lowery and J. Pennefather. Butterworth-Heinemann Ltd. Oxford.

Medical Examination of Sport SCUBA Divers, 1998. Alfred Bove, M.D., Ph.D. (ed.) Medical Seminars, Inc. San Antonio, TX.

NOAA Diving Manual, Fourth Edition, Best Publishing Company, Flagstaff, AZ.

U.S. Navy Diving Manual. Best Publishing Company, Flagstaff, AZ.

APPENDIX 2

MEDICAL EVALUATION OF FITNESS FOR SCUBA DIVING REPORT

 Name of Applicant (Print or Type)

 Date(Mo/Day/Year)

To The PHYSICIAN:

This person is an applicant for training or is presently certified to engage in diving with self-contained underwater breathing apparatus (SCUBA). This is an activity that puts unusual stress on the individual in several ways. Your opinion on the applicant's medical fitness is requested. SCUBA diving requires heavy exertion. The diver must be free of cardiovascular and respiratory disease. An absolute requirement is the ability of the lungs, middle ear and sinuses to equalize pressure. Any condition that risks the loss of consciousness should disqualify the applicant.

TESTS: Please initial that the following tests were completed.

[] Initial Examination

☐ Medical History
☐ Complete Physical Exam with emphasis
 on neurological and otological components
☐ Chest X-Ray
☐ Spirometry
☐ Hematocrit or Hemoglobin
☐ Urinalysis
☐ Any further tests deemed necessary by
 the examining physician

Additional testing for first exam over age 40

☐ Resting EKG
☐ Assessment of coronary artery disease
 using Multiple-Risk-Factor-Assessment¹
 (age, lipid profile, blood pressure, diabetic screening, smoker)

[] Re-examination (every 2 years)

☐ Medical History
☐ Complete Physical Exam with emphasis
 on neurological and otological components
☐ Hematocrit or Hemoglobin
☐ Urinalysis
☐ Any further tests deemed necessary by
 the examining physician

Additional testing for re-examination over age 40

☐ Resting EKG
☐ Assessment of coronary artery
 using Multiple-Risk-Factor-Assessment¹

Note: Exercise stress testing may be indicated based on Risk-Factor-Assessment²

RECOMMENDATION:

- ☐ APPROVAL. I find no medical condition(s) which I consider incompatible with diving.
- ☐ RESTRICTED ACTIVITY APPROVAL. The applicant may dive in certain circumstances as described in
 REMARKS.
- ☐ FURTHER TESTING REQUIRED. I have encountered a potential contraindication to diving. Additional medical
 tests must be performed before a final assessment can be made. See REMARKS.
- ☐ REJECT. This applicant has medical condition(s) which, in my opinion, clearly would constitute unacceptable
 hazards to health and safety in diving

¹ "Assessment of Cardiovascular Risk by Use of Multiple-Risk-Factor Assessment Equations." Grundy et al. 1999. AHA/ACC Scientific Statement. <http://www.acc.org/clinical/consensus/risk/risk1999.pdf>

ACC/AHA Guidelines for Exercise Testing. A report of the American College of Cardiology / American Heart Association Task Force on Practice Guidelines (Committee on Exercise Testing). RJ Gibbons, et al. 1997. Journal of the American College of Cardiology. 30:260-311. <http://www.acc.org/clinical/guidelines/exercise/exercise.pdf>

OVER

REMARKS:

I have discussed the patient's medical condition(s) which would not seriously interfere with diving but which may seriously compromise subsequent health. The patient understands the nature of the hazards and the risks involved in diving with these defects.

Date Signature _____ M.D.

Name (Print or Type)

Address

Telephone Number

My familiarity with applicant is:

€ With this exam only

€ Regular Physician for _____ years

€ Other (describe) _____

My familiarity with diving medicine:

€ On attached list of physicians

€ Other (describe) _____

APPLICANT'S RELEASE OF MEDICAL INFORMATION FORM

I authorize the release of this information and all medical information subsequently acquired in association with my diving to the _____ Diving Safety Officer and Diving Control Board or its designee at (place) _____ on (date) _____.

Signature of Applicant _____

APPENDIX 3
DIVING MEDICAL HISTORY FORM
(To Be Completed By Applicant-Diver)

Name _____ Sex _____ Age _____ Wt. _____ Ht. _____

Sponsor _____ Date ____ / ____ / ____
(Dept./Project/Program/School, etc.) (MM/DD/YYYY)

TO THE APPLICANT:

SCUBA diving makes considerable demands on your physical and emotional condition. Diving with particular defects amounts to asking for trouble not only for yourself, but to anyone coming to your aid if you get into difficulty in the water. Therefore, it is prudent to meet certain medical and physical requirements before beginning a diving or training program.

Your answers to the questions are more important, in many instances, in determining your fitness than what the physician may see, hear or feel when you are examined. Obviously, you should give accurate information or the medical screening procedure becomes useless.

This form shall be kept confidential. If you believe any question amounts to invasion of your privacy, you may elect to omit an answer, provided that you shall subsequently discuss that matter with your own physician and he/she must then indicate, in writing, that you have done so and that no health hazard exists.

Should your answers indicate a condition that might make diving hazardous, you will be asked to review the matter with your physician. In such instances, his/her written authorization will be required in order for further consideration to be given to your application. If your physician concludes that diving would involve undue risk for you, remember that he/she is concerned only with your well being and safety. Respect the advice and the intent of this medical history form.

OVER

	Yes	No	Please indicate whether or not the following apply to you	Comments
1			Trouble with your ears, including ruptured eardrum, difficulty clearing your ears, or surgery.	
2			Trouble with dizziness.	
3			Eye surgery.	
4			Depression, anxiety, claustrophobia, etc.	
5			Substance abuse, including alcohol.	
6			Loss of consciousness.	
7			Epilepsy or other seizures, convulsions or fits.	
8			Stroke or fixed neurological deficit.	
9			Recurring neurological disorders, including transient ischemic attacks.	
10			Aneurysms or bleeding in the brain.	
11			Decompression sickness or embolism.	
12			Head injury.	
13			Disorders of the blood, easy bleeding.	
14			Heart disease, diabetes, high cholesterol.	
15			Anatomical heart abnormalities including patent foramen ovale, valve problems, etc.	
16			Heart rhythm problems.	
17			Need for a pacemaker.	
18			Difficulty with exercise.	
19			High blood pressure.	
20			Collapsed lung.	
21			Asthma	
22			Other lung disease.	
23			Diabetes mellitus	
24			Are you pregnant?	
25			Have you had surgery? If yes explain below.	
26			Have you been hospitalized? If yes explain below.	
27			Do you take any medications? If yes list below.	
28			Do you have any allergies to medications, foods, environmental? If yes list below.	
29			Do you smoke?	
30			Do you drink alcoholic beverages?	
31			Do you have a family history of high cholesterol?	
32			Do you have a family history of heart disease or stroke?	
33			Do you have a family history of diabetes?	
34			Do you have a family history of asthma?	

Please explain any "yes" answers to the above questions:

I certify that the above answers and information represent an accurate and complete description of my medical history.

Signature

Date

APPENDIX 4

AAUS CHECKOUT DIVE AND TRAINING EVALUATION

Certified scientific divers and Divers-In-Training from AAUS organizational members should be able to demonstrate proficiency in the following skills during checkout dives or training evaluation dives with the Dive Safety Officer or designee:

- ___ Knowledge of AAUS diving standards and regulations
- ___ Pre-dive planning, briefing, site orientation, and buddy check
- ___ Use of dive tables and/or dive computer
- ___ Equipment familiarity
- ___ Underwater signs and signals
- ___ Proper buddy contact
- ___ Monitor cylinder pressure, depth, bottom time
- ___ Swim skills:
 - ___ Surface dive to 10 ft. without scuba gear
 - ___ Demonstrate watermanship and snorkel skills
 - ___ Surface swim without swim aids (400 yd. <12min)
 - ___ Underwater swim without swim aids (25 yd. without surfacing)
 - ___ Tread water without swim aids (10 min.), or without use of hands (2 min.)
 - ___ Transport another swimmer without swim aids (25yd)
- ___ Entry and exit (pool, boat, shore)
- ___ Mask removal and clearing
- ___ Regulator removal and clearing
- ___ Surface swim with scuba; alternate between snorkel and regulator (400 yd.)
- ___ Neutral buoyancy (hover motionless in midwater)
- ___ Proper descent and ascent with B.C.
- ___ Remove and replace weight belt while submerged
- ___ Remove and replace scuba cylinder while submerged
- ___ Alternate air source breathing with and without mask (donor/receiver)
- ___ Buddy breathing with and without mask (donor/receiver)
- ___ Simulated emergency swimming ascent
- ___ Compass and underwater navigation
- ___ Simulated decompression and safety stop
- ___ Rescue:
 - ___ Self rescue techniques
 - ___ Tows of conscious and unconscious victim
 - ___ Simulated in-water rescue breathing
 - ___ Rescue of submerged non-breathing diver (including equipment removal, simulated rescue breathing, towing, and recovery to boat or shore)
 - ___ Use of emergency oxygen on breathing and non-breathing victim
 - ___ Accident management and evacuation procedures

Additional Training (optional)

- ___ Compressor/ Fill station orientation and usage
- ___ Small boat handling

APPENDIX 5
GUIDELINES FOR DIVE COMPUTER USE

1. Only those makes and models of dive computers specifically approved by the Diving Safety Officer may be used.
2. Each diver relying on a dive computer to plan dives and indicate or determine decompression status must have his/her own computer.
3. On any given dive, both divers in the buddy pair must follow the most conservative dive computer.
4. If the dive computer fails during the dive, the dive must be terminated and appropriate surfacing procedures should be initiated immediately.
5. A diver should not dive during the 24 hours preceding the activation of his/her dive computer for use in controlling a dive.
6. Once a dive computer is in use, it must not be switched off until it indicates that complete out gassing has occurred or 18 hours have elapsed, whichever occurs first.
7. When using a dive computer, non-emergency ascents are to be at the rate specified for the make and model of the dive computer being used.
8. Ascent rates shall not exceed 40 fsw/min in the last 60 fsw or the computer's recommended rate, whichever is slower.
9. Whenever practical, divers using a dive computer should make a stop between 10 and 30 feet for 5 minutes, especially for dives below 60 fsw.
10. Repetitive and multi-level diving procedures should start the dive or series of dives, at the maximum planned depth, followed by subsequent dives of shallower exposures.
11. Multiple deep dives should be avoided.
12. Computers shall not be used for diving in fresh water or at altitude, unless the dive computer specifically allows for such dives.
13. A time measuring device (diving watch) and suitable depth gauge must be worn in addition to a dive computer. A log of maximum depth, dive time, and surface intervals shall be maintained as a backup.

I certify that I have read the dive computer instruction manual and the guidelines listed above, and that I agree to abide by these rules. I understand that there is a potential risk of decompression sickness in all diving activities, and I will strive to minimize this risk by using the accepted decompression practices as specified above.

Name _____ Date: _____
Print Signature

Make _____ Model _____ s.n. _____

Approved: _____
Diving Safety Board Member

APPENDIX 6

REQUEST FOR DIVING RECIPROCITY FORM

VERIFICATION OF DIVER TRAINING AND EXPERIENCE

The visiting diver will comply with the diving regulations of the host organization's Diving Safety Manual unless previously arranged by both organizations' Diving Control Boards.

The host organization has the right to approve or deny this request and may require, at a minimum, a checkout dive with the Diving Safety Officer (DSO) or designee of the host organization. If the request is denied, the host organization should notify to the DSO of the visiting diver the reason for the denial. The DSO for the visiting scientific diver has confirmed the following information:

(Date) _____

☐ Written scientific diving examination
☐ Last diving medical examination
☐ Most recent checkout dive
☐ SCUBA regulator/equipment service/test
☐ CPR training (Agency) _____
☐ Oxygen administration (Agency) _____
☐ First aid for diving _____
☐ Date of last dive _____

Number of dives completed within previous 12 months? _____

Depth certification _____

Any restrictions? (Y/N) _____ if yes, explain: _____

Please check any pertinent specialty certifications:

<input type="checkbox"/> Dry suit	<input type="checkbox"/> Rescue	<input type="checkbox"/> Blue water
<input type="checkbox"/> Dive Computer	<input type="checkbox"/> Divemaster	<input type="checkbox"/> Altitude
<input type="checkbox"/> NITROX	<input type="checkbox"/> Instructor	<input type="checkbox"/> Ice/Polar
<input type="checkbox"/> Mixed gas	<input type="checkbox"/> EMT	<input type="checkbox"/> Cave
<input type="checkbox"/> Closed circuit	<input type="checkbox"/> Dive Accident Management	<input type="checkbox"/> Night
<input type="checkbox"/> Saturation	<input type="checkbox"/> Chamber operator	Other _____
<input type="checkbox"/> Decompression	<input type="checkbox"/> Lifesaving	

Name of diver: _____

Emergency Information: (To notify in an emergency)

Name: _____

Relationship: _____

Telephone: (work) _____ (home) _____

Address: _____

This is to verify that the above individual is currently a certified scientific diver at:

(Name Sponsoring Organization) _____

Diving Safety Officer: _____ (Signature) _____ (Date)

Mark Windham 916.227.5460 (T), 916.227.5169 (F), 916.445.0045 dispatch, mwindham@dfg.ca.gov

(Print) (Telephone, FAX, and Email)

APPENDIX 7
DIVING INJURY/INCIDENT REPORT FORM

Required Incident Reporting: All diving incidents requiring recompression treatment, or resulting in moderate or serious injury, or death shall be reported the DSB. The report will specify the circumstances of the incident and the extent of any injuries or illnesses. This form is confidential and for statistics purposes only.

Check the appropriate space(s) & complete the form:

<input type="checkbox"/> Simple Illness	<input type="checkbox"/> Referred to Physician	<input type="checkbox"/> Serious injury
<input type="checkbox"/> Barotrauma	<input type="checkbox"/> Hyperbaric Treatment	<input type="checkbox"/> Near Drowning
<input type="checkbox"/> Hyperoxic	<input type="checkbox"/> Hypercapnea	<input type="checkbox"/> Fatality
Workers' Compensation Claim Yes <input type="checkbox"/> No <input type="checkbox"/>		
<input type="checkbox"/> Other: _____		

Descriptive Report (use additional sheets if necessary)

Date of Incident: ____/____/____
Month Day Year

Circumstances and the extent of the injuries or illnesses:

Treatment provided and results:

Recommendations to avoid repetition of incident:

Name & Title of Person Submitting Report: _____
(Please print)

Signature _____ Date ____/____/____

Mailing Address _____

Telephone/FAX _____ e-mail _____

APPENDIX 8
DEPARTMENT REPORT OF MINOR INJURY

Name	SSN	Date of Birth	Sex (M/F)
Region/Division/Branch/Office			
Address of Region/Division/Branch/Office			
Location Where Injury Occurred			
Classification	Date of Injury	Time of Injury	Date Injury Reported
Describe the Injury and How it Occurred (include part of body affected)			
Treatment			
Comments			
Signature of Injured		Signature of Supervisor	
Dated		Dated	

INSTRUCTIONS:

1. The supervisor will complete this form when an employee reports an injury, but did not lose time and did not see a doctor.
2. This form can be used to help complete the 3067 if an employee eventually loses time or decides to see a doctor for this injury.
3. The Supervisor will retain this form for a minimum of five years (this form may be attached to the 3067 if one is completed).

FG-PERS-300

APPENDIX 9

DIVING EMERGENCY MANAGEMENT PROCEDURES FORM

Introduction

A diving accident victim could be any person who has been breathing air underwater regardless of depth. It is essential that emergency procedures are pre-planned and that medical treatment is initiated as soon as possible. It is the responsibility of each AAUS organizational member to develop procedures for diving emergencies including evacuation and medical treatment for each dive location.

General Procedures

Depending on and according to the nature of the diving accident, stabilize the patient, administer 100% oxygen, contact local Emergency Medical System (EMS) for transport to medical facility, contact diving accident coordinator, as appropriate. Explain the circumstances of the dive incident to the evacuation teams, medics and physicians. Do not assume that they understand why 100% oxygen may be required for the diving accident victim or that recompression treatment may be necessary.

- 1. Make appropriate contact with victim or rescue as required.**
- 2. Establish (A)irway, (B)reathing, (C)irculation as required.**
- 3. Administer 100% oxygen, if appropriate (in cases of Decompression Illness, or Near Drowning).**
- 4. Call local Emergency Medical System (EMS) for transport to nearest medical treatment facility.**
- 5. Call the appropriate Diving Accident Coordinator for contact with diving physician and recompression chamber, etc.**
- 6. Notify DSO or designee according to the Department Emergency Action Plan.**
- 7. Complete and submit Incident Report Form (Appendix 7) to the DCB.**

List of Emergency Contact Numbers Appropriate for Dive Location:

[illegible]

APPENDIX 10
DIVING WITH NITROX FORM

I certify that I have read the Diving Safety Program NITROX guidelines, and that I agree to abide by them. I understand that there are potential risks associated with the use of NITROX that may be greater than those of normal air.

Name: _____ Signature: _____

Date of NITROX Certification: _____ Certifying Agency: _____

Date: _____ DSB Certification Check: _____ EAN>40: ____

APPENDIX 11

Diver: _____ Month: _____ Year: _____ Certified Depth: _____
Phone: _____ Physical: _____ Dive to cert.depth: _____ CPR: _____ Oxygen: _____ Haz mat: _____

Equipment Checks

Regulator(s): _____ Tank Press. Gauge: _____ Depth Gauge: _____ Computer(C)/Tables(T) Used (Specify): _____

Dives this year:

Jan _____ Feb _____ Mar _____ Apr _____ May _____ Jun _____ Jul _____ Aug _____ Sep _____ Oct _____ Nov _____ Dec _____

[illegible]

L.I.	Last 4 of SSN	Year (yy)	Month (mm)
------	---------------	-----------	------------

Purpose Codes

1. Scientific

1. A separate report must be filed for equipment failures, accidents, or potential dangerous experiences. Did any occur?
2. Fill in personal data, date, and totals and submit this form to the Diving Safety Officer each month.
3. Submit this report in duplicate with your monthly time sheet whether or not dives were made.
4. Divers must have a minimum of 10 in water scuba dives per each calendar 6 month period (January - June & July - December).

2. Law Enforcement
3. Training
4. Recreational
5. Light Commercial

APPENDIX 12

INFORMATION FOR SCUBA DIVER APPLICANTS

This packet contains the following information and forms:

1. SCUBA APPLICATION FORM (See Appendix 14) – Fill out this form completely, using extra pages if necessary. When submitting, be sure you have had your Supervisor and Manager (Administrator, Division Chief, or Regional Manager) sign the bottom of the form. Include a legible copy of the following certifications:

- Your basic Open Water SCUBA certification from a recognized RSTC organization, and any other advanced or specialty cards
- A Rescue Diver course from a recognized RSTC organization
- First Aid and CPR (CPR must have been within the last two years)
- An Emergency Oxygen Administration course (DAN or equivalent)

2. MEDICAL EVALUATION FORMS (See Appendices 1-3) – This includes a Medical History to be completed by the applicant and a Fitness for Diving Report to be completed by a physician after a physical examination. The examination must have been within 24 months of the scheduled DFG Diver Certification Course. The form should be returned directly to the applicant for inclusion in the completed application package.

3. SCUBA DIVER CHECKLIST FOR CERTIFICATION – This form lists the testing requirements to become a Department SCUBA diver. Note that the Swimming Evaluation (*DSM, Section 4.32.3*) must be completed and verified **prior** to the certification course. If these skills are not performed satisfactorily and completely, applicants shall not be allowed to attend the certification course. An applicant should fill in the personal information on this form and bring it with him/her to the evaluation test site. Tests may be verified by members of the Diving Safety Board, their designees, or project supervisors. Be sure that every requirement is signed off.

4. DEPARTMENT OF FISH AND GAME DIVING SAFETY MANUAL – This document contains the operational mandates and auspices for all SCUBA activities. Applicants need to be thoroughly familiar with its provisions and equipment requirements **prior** to attending the certification course.

5. LIST OF REQUIRED SCUBA EQUIPMENT – This is contained in Section 3.00 of the *Diving Safety Manual*. All required equipment listed is mandatory for the certification course. Subject to your supervisor's approval, these items may be purchased or rented at Department expense. Any borrowed SCUBA equipment must comply with Department inspection and servicing guidelines as specified in the *DFG Diving Safety Manual*. Note: Regardless if a weight integrated BCD is to be utilized during the certification, applicants will still need to be competent with and provide a separate weight belt for the course.

Completed packages should be submitted to the Diving Safety Officer at least two weeks prior to the scheduled certification course. Submittal of the package does not guarantee a placement in the course. Openings are limited and filled on a first come, first served basis.

Candidates should submit completed packages directly to:

**Department of Fish and Game
Diving Safety Program**

Attn: Lt. Mark Windham

3201 S Street

Sacramento, CA 95816

916.227.5460 office voice

916.227.5169 office fax

mwindham@dfg.ca.gov e-mail

When your forms have been reviewed and approved, you should start on the Department *SCUBA Diving Examination*. The examination is an extensive open book, research test requiring use of the *DFG Diving Safety Manual* and the *NOAA SCUBA Diving Manual* as reference materials. Recreational SCUBA organization texts may provide good background material, but due to a wide range of standards, practices, and tables, be sure to base your answers on the texts listed. When completed, the entire examination should be copied. You may submit a copy to a Diving Safety Board member for review and correction, however the original must be brought to the certification course for group review and discussion. Since this is open book, applicants must receive a score of 90 percent to pass this phase of the certification process.

If you, or your supervisor, have any questions regarding the Certification Course schedules or content, completion of your package, equipment or skill requirements, please give me a call. I'm on the road with classes quite a bit, so consider giving me a little lead-time to get back to you. Members of the Diving Safety Board are also available to help you. Good luck with the DFG Diving Certification process.

**DEPARTMENT OF FISH AND GAME
DIVING SAFETY PROGRAM****SCUBA DIVER EVALUATION CHECKLIST (Revised)****Swimmer Name:** _____ **Date:** _____**1. 1000 Foot Swim** Completed: **Yes No** Time: _____

(Standard: Swimmer shall complete this test without the use of fins or floatation device and without touching the bottom in under nine minutes.)

2. 75 Foot Underwater Swim Completed: **Yes No**

(Standard: Swimmer shall complete this test on one breath without the use of fins and without touching the bottom.)

3. Weight Recovery Completed: **Yes No**

(Standard: Swimmer shall pick up a 15 pound weight belt or package off a 15 foot bottom and hand it off at the surface breath hold without the use of fins.)

4. 75 Foot Weight Swim Completed: **Yes No**

(Standard: Swimmer shall carry a 15 pound weight belt or package continuously for 75 feet without the use of fins and without touching the bottom.)

5. Survival Swim Completed: **Yes No**

(Standard: Swimmer shall maintain surface buoyancy continuously for 15 minutes without the use of fins or floatation device and without touching bottom.)

Certification by supervisor or Diving Safety Board Member:

I certify that I witnessed the named swimmer complete or not complete these tests according to the standards listed.

Name: _____ **Title:** _____ **Signature:** _____

DEPARTMENT OF FISH AND GAME DIVING SAFETY PROGRAM

Required Equipment for Diver Certification Course (Revised)

Mask (With Nose Pocket)

Fins

Snorkel

Wetsuit (With Boots & Gloves, Appropriate for Water Conditions)

Weight Belt (Full Ballast with Quick Release)

Regulator (Balanced First Stage, Single Hose Second Stage)

Alternate Air Source (Octopus, Air 2, Redundant)

Submersible Cylinder Pressure Gauge

Air Cylinders (Two; Either Steel or Aluminum +/- 80cf)

Buoyancy Control System

Cylinder Backpack (If not integral with BCS above)

Depth Gauge

Diving Watch / Timer

Submersible Compass

Knife / Cutting Tool

Diving Tables (US Navy No Decompression Limit)

Diving Light

Whistle

Underwater Slate

Note: This is a list of minimum required equipment. You may bring more but storage on boats and/or diving facilities is limited. If you utilize a Buoyancy Control System with integrated weight capability you will still need to bring a separate weight belt and weights. Cylinders may be available at the training site.

APPENDIX 13
SCUBA EXAM (June 1999 Edition)

NAME: _____ **Date:** _____

Score: _____

Instructions and Notes: This is an open book exam. Answers to all questions can be found in the following texts: Department Diving Safety Manual, NOAA Dive Manual, US Navy Diving Manual (Volume 1), USCG Rules of the Road, and various recreational dive texts (i.e. NAUI Advanced Diving, PADI Encyclopedia of Recreational Diving, etc.).

Where conflicts arise the Department and NOAA manuals will prevail. Dive table answers will be derived using the enclosed tables (USN). You must show your work on the exam, or on a plain piece of white paper with the question number on all responses requiring calculations or use of the dive tables.

Please provide the text reference for your answer (where appropriate) next to the question number.

EQUIPMENT:

1) What is the most important feature required on all belts and harnesses used in diving?

- a) Corrosion resistant material
- b) Right hand quick release connection
- c) Elastic material for comfort
- d) Natural color to blend in to background
- e) Environmentally friendly material

2) What procedure would you use to check your buoyancy compensator before diving?

- a) Inflate the device orally
- b) Inflate the device using the power inflator
- c) Deflate the device using the deflator
- d) Squeeze the device to test the overpressure valves
- e) All of the above

- 3) Which of the following are not the correct names of a SCUBA tank valve?
- a) J-valve
 - b) K-valve
 - c) DIN valve
 - d) Schraeder valve
 - e) All of the above
- 4) Refer to Figure 1 (Attached), and label the following:
- a) Purge button
 - b) Diaphragm
 - c) Exhaust valve
 - d) Second stage downstream valve
 - e) Mouthpiece
- 5) An 1800 psi cylinder is pressurized to ____psig when hydrostatically tested?
- a) 1800 psig
 - b) 2250 psig
 - c) 3000 psig
 - d) 4500 psig
 - e) None of the above
- 6) The reserve lever on a J-valve needs to be in what position when being filled?
- a) Down
 - b) Up
 - c) In the middle
 - d) It doesn't matter
- 7) Green discoloration on the first stage filter suggests what CONDITION?
- a) The pressure rating of the filter assembly
 - b) Exposure to excess pressure
 - c) The color of the material
 - d) Exposure to salt water and corrosion
 - e) None of the above

8) Which of the following describes the difference between steel and aluminum SCUBA cylinders?

- a) Steel cylinders are heavier
- b) Steel cylinders are stronger
- c) Aluminum cylinders hold more air
- d) Aluminum cylinders last longer
- e) All of the above

9) Explain the meaning of each legally required mark that appears on the neck of a SCUBA tank including: alloy designation, hydrostatic test date, working pressure, and over-pressure designation.

10) Explain the proper use of dive computers among buddy teams.

11) State the type of depth gauge that automatically compensates for high-altitude diving.

12) Define the terms *balanced*, *unbalanced*, *upstream* and *downstream* as they relate to regulator design.

13) What is the safety device that prevents an over pressurized SCUBA tank from exploding?

- a) Burst disc
- b) Schraeder valve
- c) Cylinder liner
- d) J-valve
- e) Stem gauge

14) What type of regulator will maintain a constant intermediate pressure in spite of varying tank pressure?

- a) Upstream tilt valve second stage
- b) Downstream tilt valve second stage
- c) Balanced piston first stage
- d) Balanced diaphragm first stage
- e) C and d above

15) Bourdon tubes are most commonly found where?

- a) Underwater compass
- b) Depth gauges
- c) Regulator stages
- d) Submersible pressure gauge
- e) B and d above

POLICY:

16) What are the required inspection periods for the following:

- a. Regulator _____mo.
- b. VIP _____mo.
- c. Hydrostatic test _____yr.
- d. SPG _____mo.
- e. Buoyancy compensator _____mo.
- f. Depth gauge _____mo.

17) Under what conditions may a Department diver make a job related decompression dive?

18) What three (3) items of diving equipment or diving environments require additional training not covered in the Department certification course?

19) Name two (2) types of breathing apparatus, other than open circuit, available to Department divers and list the criteria that has to be met before their use.

ENVIRONMENT:

- 20) What is a current that runs from shore outward through the surf called?
- 21) List three (3) general safety considerations to be determined before diving in unfamiliar locations.
- 22) You will be entering and exiting through moderate surf. Describe factors to be considered, decision points and alternatives in planning a safe dive.
- 23) The horizontal boundary between waters of differing salinity is called?
- 24) The horizontal boundary between waters of differing temperature is called?
- 25) The distance between successive wave crests or troughs is called?
- 26) Currents in bodies of water are primarily caused by what?
- 27) What is the direction of rotation for the predominant ocean currents in the Northern Hemisphere?
- 28) What is the most useful diving skill for avoiding damage to the marine environment?
- 29) Define magnetic Variation and Deviation as it relates to marine navigation.
- 30) You see a vessel at night displaying three (3) lights in a vertical line, top and bottom being red and the middle being white. What does this mean? What would this vessel display during daylight?
- 31) You are asked to make a dive in an area with a lot of protected coves, there are rough conditions outside of the coves. Your plan is to enter the water in one of these coves, submerge, and proceed to the dive location by compass. While still in transit, you notice giant kelp angled steeply in your direction of travel. At 500 psig, you complete your dive. Your team surfaces to discover yourselves ¼ mi. South of the cove. How could you have kept your team out of this situation?

- 32) What is the geographic feature at 41°21'N, 124° 11'W?
- 33) Give the conditions you would expect if the weather report stated Beaufort Force 6.
- 34) What causes waves to break right on shore? Could this be a problem for a beach entry?
- 35) In general what state of tide offers the best visibility?
- 36) What type of weather would you expect from a warm front?

PHYSIOLOGY:

- 37) Fatty tissues under hyperbaric conditions accumulate which gas found in air?
- a) Nitrogen
 - b) Oxygen
 - c) Hydrogen
 - d) Xenon
 - e) Nitrous Oxide
- 38) You are planning a dive with a beach entry. There is a 6 ft. swell running. Of what pressure related problem must you be aware?
- a) Barotrauma
 - b) Mediastinal emphysema
 - c) Subcutaneous emphysema
 - d) Decompression sickness
 - e) Nitrogen narcosis
- 39) Why is hyperventilation dangerous when skin-diving?
- 40) Why is equalizing your ears more difficult while descending from the surface to 33 ft. than from 100

to 133 ft.?

Describe the following. Give cause, symptoms, and preventive action:

41) Hypothermia

42) Carbon Dioxide excess

43) Carbon Monoxide excess

44) Pneumothorax

45) Mediastinal and Subcutaneous Emphysema

46) Nitrogen Narcosis

47) Embolism

48) Decompression sickness

49) Explain the physiological mechanism that causes a *carotid sinus reflex*, and how this affects the diver. How can this be avoided?

50) Label the areas of the ear most affected by changing pressure (see Figure 2, attached).

51) Define the term *silent bubbles* as it relates to decompression sickness.

52) The best First Aid for an air embolism or DCS is?

53) Symptoms of DCS will occur in about 98% of the cases within how many hours of surfacing?

54) When problems are experienced with equalizing due to congestion in the sinuses, the best procedure is?

55) Symptoms of O₂ poisoning include:

56) Non-frothy blood in the mask after ascent is a sign of what?

- a) Impacted tooth
- b) Pneumothorax
- c) Decompression sickness
- d) Conjunctival hemorrhage
- e) Ruptured sinus

57) Conjunctival hemorrhage can be caused by what piece of dive gear?

- a) Non-adjustable fin straps
- b) Straps which become too tight at depth
- c) Snorkel mouthpiece
- d) Mask
- e) None of the above

58) The minimum depth at which a SCUBA diver can experience an air embolism is?

59) What is the only effective treatment for DCS?

60) Give three (3) rules to avoid air embolism.

61) What is hyperthermia? How can you prevent it?

62) Explain how proper diving technique and equipment can prevent exhaustion and excessive buildup of Carbon Monoxide.

PHYSICS:

Define the following terms:

63) Gauge pressure

64) Absolute pressure

65) What is the absolute pressure at the following depths?

27fsw	___psia
57fsw	___psia
101fsw	___psia
38ffw	___psia

66) The air you breath from a SCUBA tank is _____ as dense at 33fsw as it is at sea level.

67) Two (2) SCUBA tanks are available for a dive to 50fsw, you want the one that will provide the most air. One tank is an aluminum '80' filled to 2000psig, the other is a steel '72' filled to the same pressure. Which do you choose?

68) What temperature change occurs in a SCUBA tank being filled?

69) What is the Surface Equivalent (SE) of 1% CO at a depth of 66fsw?

70) If the breathing gas in you SCUBA tank is 20% O₂, what will be the partial pressure (ppO₂) at a depth of 66fsw? What will the SE be?

71) Assuming a 20% O₂ mix, at what depth will the risk of oxygen toxicity become a priority?

72) What is the partial pressure of the following gases at the stated depths?

a. Sea level: Nitrogen (N) _____ Oxygen (O_2) _____

b. 33fsw: Nitrogen (N) _____ Oxygen (O_2) _____

c. 41fsw: Nitrogen (N) _____ Oxygen (O_2) _____

73) What is the percentage of volume reduction experienced by a gas in a flexible container when taken from sea level to 33fsw?

74) Explain why water is able to dissipate heat faster than air and what effect this has on a diver.

75) A balloon filled with air has a volume of six (6) cubic feet at 99fsw, what will the volume of the balloon be at 66fsw? If taken to the surface what might happen?

76) The different in weight between two(2) cubic feet of fresh water and the same volume of sea water is?

77) A neutrally weighted ocean diver and his equipment weight 200lbs. How much will he adjust his weight to be neutral in fresh water?

78) How many 50 lbs lift bags, weighting 2 lbs each, are needed to lift a three(3) cubic foot object with a dry weight 287 lb from a depth of 102 ffw?

79) If you fill a SCUBA tank to 2100psig at sea level, then lower the tank to 99 fsw, what will the pressure in the tank be?

80) Why do increased depths make a diver less buoyant? What can you do about it?

81) If at your present surface air consumption (SAC) you use a tank in 60 minutes, how much time will you have at 66fsw?

82) Absolute pressure which is equal to twice atmospheric pressure is found at what depth?

83) At what depth does $ppO_2=1.0$ Atmospheres?

84) As the partial pressure of a gas increases what happens to that gases solubility?

85) What happens to light as it enters the water? What is this phenomenon called?

86) Why can't you determine direction of sound underwater?

87) Using the 'Rule of Thirds' as a guideline determine the outcome of the following:

Diver 1 is using a 100 cubic foot tank @ 3500psi and breaths 14 psi/min. at the surface.

Diver 2 is using a 108 cubic foot tank @ 2640 and consumes 22 psi/min. at the seal level.

Diver 2 runs out of air during a 100 fsw dive just as Diver 1 reaches his 'turn point'. What happens if they cannot make a direct ascent to the surface? How could they better plan this dive?

DIVE TABLES:

USE ONLY THE TABLES PROVIDED (Attachment 3)

88) Define the following as they apply to computing dive profiles:

- a. Bottom time
- b. Depth
- c. Residual nitrogen time (RNT)
- d. Surface interval
- e. No decompression limit (NDL)

89) Why do residual nitrogen times generally decrease with increasing depth on repetitive dive tables?

90) You plan on making a series of dives in the same work day, would you make a precautionary decompression stop at the end of any of these dive? Why?

91) Will free diving between dives affect your dive profile? Should it?

92) You dive the following profile:

Dive 1 48min @ 66fsw
Surface interval 1hr 50 min
Dive 2 10min@75fsw

What is your group at the end of the first dive?

What is your group at the beginning of the second dive?

What is your group at the end of the second dive?

What group will allow another dive for 10 min. @ 60fsw?

What is the surface interval (SI) thy you will have to endure to make the above mentioned dive?

Is there anything wrong with this profile? Is it safe? How could it be make safer?

93) Consider the following profile:

0920 Start descent
0922 Arrive @ 40fsw
0925 Arrive @ 100fsw
0930 Arrive @ 60fsw
0935 Begin ascent
0939 Start descent
0940 Arrive @ 60fsw

Assuming a normal rate of ascent, when did you break the surface?

What is your repetitive group for the previous question?

When do you begin your final ascent to avoid the NDL?

What action would be easiest to do to make the profile safer?

94) Dive profile:

Dive 1	37min. @ 58fsw
Surface Interval	15min.
Dive 2	20min. @ 58fsw

What is your group after the first dive?

What is your group before the second dive?

What is your group after the second?

If it was necessary to decompress, what is the stop time and depth?

How can you make this dive safer?

95) Arrange the following dives in the safest order:

56min. @60fsw
30min. @20fsw
5min. @40fsw

SI is always 20 min.

What is your group at the beginning of the second dive?

What is your group at the beginning of the third dive?

96) You dive the following:

0830 Begin descent
0835 Arrive @ 63fsw
0917 Begin ascent
0919 Surface
1121 Begin descent
1123 Arrive @50fsw

1203 Begin ascent

1205 Surface

What was your bottom time on the first dive?

What is your group after the first dive?

If the second dive had been planned to a depth of 40fsw, what would have been your RNT?

What is your RNT following the first dive?

What is your group following the second dive?

After your second dive you find that the anchor is stuck and the fathometer is reading 50fsw. Strong afternoon winds are picking up and conditions are deteriorating rapidly (Sea State 4 going to 5). Your choices are to buoy off the anchor or dive to try to free the line. If you choose to dive, what is your surface interval? Explain your choice.

97) Each of you bring to the class your own unique experiences. Please prepare a question to present at the exam review session.

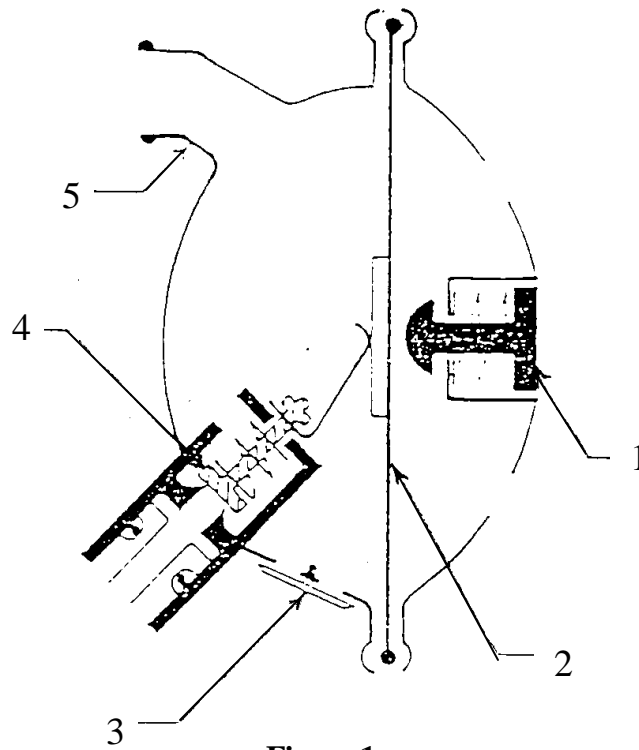


Figure 1

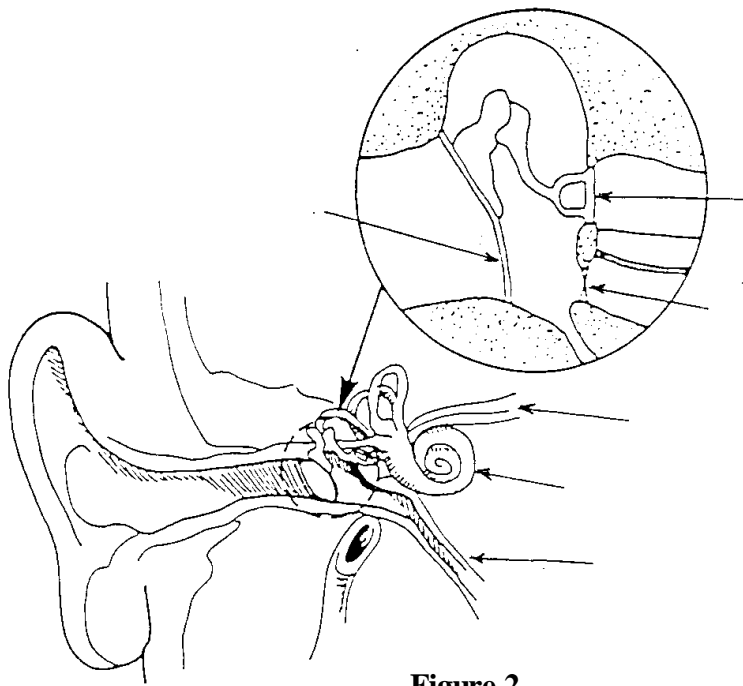


Figure 2

APPENDIX 14

APPLICATION FOR SCUBA DIVER CERTIFICATION

Personal Data:

Name _____ Date of Birth _____ Age _____

Title _____ Branch/Division _____ Region _____

Work Address _____ E-Mail _____

_____ Work Phone _____

Emergency Contact(s) _____ Relationship _____
Phone _____

Diving Certifications: (Use back of sheet for additional information.)

<u>Course Title</u>	<u>Agency</u>	<u>Date Completed</u>	<u>Hours</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Experience:

Swimming _____ hours Boat Operation _____ hours Skin Diving _____ hours

Freshwater SCUBA _____ hours Ocean SCUBA _____ hours Com/Mil Diving _____ hours

Boat Diving _____ hours Surface Supplied _____ hours Number of Surf Entries and Exits _____
Please list your last 12 SCUBA dives:

	<u>Date</u>	<u>Location</u>	<u>Depth/Time</u>	<u>Activity</u>
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____

4 _____
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5 _____
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6 _____
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7 _____
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8 _____
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9 _____
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10 _____
—
11 _____
—
12 _____
—

Approvals: Supervisor _____

Reg. Mgr./Br. Chief _____

**APPENDIX 15
DEFINITION OF TERMS**

Air sharing - The sharing of an air supply between divers.

ATA(s): Abbreviation for “Atmospheres Absolute”, defines as the total pressure exerted on an object, by a gas or mixture of gases, at a specific depth or elevation, including normal atmospheric pressure.

Bottom Time - The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins a direct ascent to the surface.

Breath-hold Diving - A diving mode in which the diver uses no self-contained or surface-supplied air or oxygen supply.

Buddy Breathing - The sharing of a single air source between divers.

Buddy Diver - Second member of the dive team.

Buddy system - Two comparably equipped scuba divers in the water in constant communication.

Buoyant Ascent - An ascent made using some form of positive buoyancy.

Burst Pressure - The pressure at which a pressure containment device would fail structurally.

Certified Diver - A diver who holds a recognized valid certification from a organizational member or recognized certifying agency.

Controlled Ascent - Any one of several kinds of ascents including normal, swimming, and air sharing ascents where the diver(s) maintain control so a pause or stop can be made during the ascent.

Cylinder - A pressure vessel for the storage of gases.

Decompression Chamber - A pressure vessel for human occupancy. Also called a hyperbaric chamber or recompression chamber.

Decompression Sickness - A condition with a variety of symptoms which may result from gas and bubbles in the tissues of divers after pressure reduction.

Decompression Table - A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures. (Also called dive tables.)

Dive - A descent into the water, an underwater diving activity utilizing compressed gas, an ascent, and return to the surface.

Dive Computer- A microprocessor based device which computes a diver's theoretical decompression status, in real time, by using pressure(depth) and time as input to a decompression model, or set of decompression tables, programmed into the device.

Dive Location - A surface or vessel from which a diving operation is conducted.

Dive Site - The physical location of a diver during a dive.

Diver - An individual in the water who uses apparatus, including snorkel, which supplies breathing gas at ambient pressure.

Diver-In-Training - An individual gaining experience and training in additional diving activities under the supervision of a dive team member experienced in those activities.

Diver-Carried Reserve Breathing Gas - A diver-carried independent supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by another diver.

Diving Mode - A type of diving required specific equipment, procedures, and techniques, for example, snorkel, scuba, surface-supplied air, or mixed gas.

Diving Safety Board (DSB). The group of individuals who act as the official representative of the membership organization in matters concerning the scientific diving program (see Sec. 1.23).

Diving Safety Officer (DSO) - The individual responsible for the safe conduct of the scientific diving program of the membership organization (see Sec. 1.22).

EAD: An abbreviation for Equivalent Air Depth (see below).

Emergency Ascent - An ascent made under emergency conditions where the diver exceeds the normal ascent rate.

Enriched Air or Enriched Air Nitrox (EAN): Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 21% and 41% oxygen. This term is considered synonymous with the term "NITROX".

Equivalent Air Depth (EAD): The depth at which air will have the same nitrogen partial pressure as the nitrox mixture being used. This number, expressed in units of feet seawater, will always be less than the actual depth for any enriched air mixture.

fN₂: fraction of nitrogen in a gas mixture, expressed as either a decimal or percentage, by volume.

fO₂: fraction of oxygen in a gas mixture, expressed as either a decimal or percentage, by volume.

FSW - Feet of seawater, or equivalent static head.

Hookah Diving - A type of shallow water surface-supplied diving where there is no voice communication with the surface.

Hyperbaric Chamber - See decompression chamber.

Hyperbaric Conditions - Pressure conditions in excess of normal atmospheric pressure at the dive location.

Lead Diver - The certified scientific diver with experience and training to conduct the diving operation.

Maximum Working Pressure - The maximum pressure to which a pressure vessel may be exposed under standard

operating conditions.

Organizational member - An organization which is a current member of the AAUS, and which has a program which adheres to the standards of the AAUS as set forth in the AAUS Standards for Scientific Diving Certification and Operation of Scientific Diving Programs.

Mixed-Gas Diving - A diving mode in which the diver is supplied in the water with a breathing gas other than air.

MOD: Maximum Operating Depth, usually determined as the depth at which the pO₂ for a given gas mixture reaches a predetermined maximum.

MSW - Meters of seawater or equivalent static head.

NITROX: Any gas mixture comprised predominately of nitrogen and oxygen, most frequently containing between 21% and 41% oxygen. Can also be referred to as Enriched Air or Enriched Air Nitrox, abbreviated EAN.

NOAA Diving Manual: refers to the *NOAA Diving Manual, Diving for Science and Technology*, Fourth Edition, National Undersea Research Program, Best Publishing, 2000, Flagstaff, AZ.

No-Decompression limits - The depth-time limits of the "no-decompression limits and repetitive dive group designations table for no-decompression air dives" of the U.S. Navy Diving Manual or equivalent limits.

Normal Ascent - An ascent made with an adequate air supply at a rate of 60 feet per minute or less.

Oxygen Clean: All combustible contaminants have been removed.

Oxygen Compatible: A gas delivery system that has components (o-rings, valve seats, diaphragms, etc. ...) that are compatible with oxygen at a stated pressure and temperature.

Oxygen Service: A gas delivery system that is both oxygen clean and oxygen compatible.

Oxygen Toxicity: Any adverse reaction of the central nervous system ("acute" or "CNS" oxygen toxicity) or lungs ("chronic", "whole-body", or "pulmonary" oxygen toxicity) brought on by exposure to an increased (above atmospheric levels) partial pressure of oxygen.

Pressure-Related Injury - An injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include: decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, or ruptured eardrum.

Pressure Vessel - See cylinder.

pN₂: Inspired partial pressure of nitrogen, usually expressed in units of atmospheres absolute.

pO₂: Inspired partial pressure of oxygen, usually expressed in units of atmospheres absolute.

psi: Abbreviation for the unit of pressure, "pounds per square inch".

Psig - Abbreviation for the unit of pressure, "pounds per square inch gauge".

Recompression Chamber - see decompression chamber.

Scientific Diving - Scientific diving is defined (29 CFR 1910.402) as diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks.

Scuba Diving - A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Standby Diver - A diver at the dive location capable of rendering assistance to a diver in the water.

Surface Supplied Diving - A diving mode in which the diver in the water is supplied from the dive location with compressed gas for breathing.

Swimming Ascent - An ascent that can be done under normal or emergency conditions accomplished by simply swimming to the surface.

Umbilical - The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies a diver or bell with breathing gas, communications, power, or heat, as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

Working Pressure - The normal pressure at which the system is designed to operate.